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Top-secret Norden bombsight story

WAR MONTHLY

ISSUE 23

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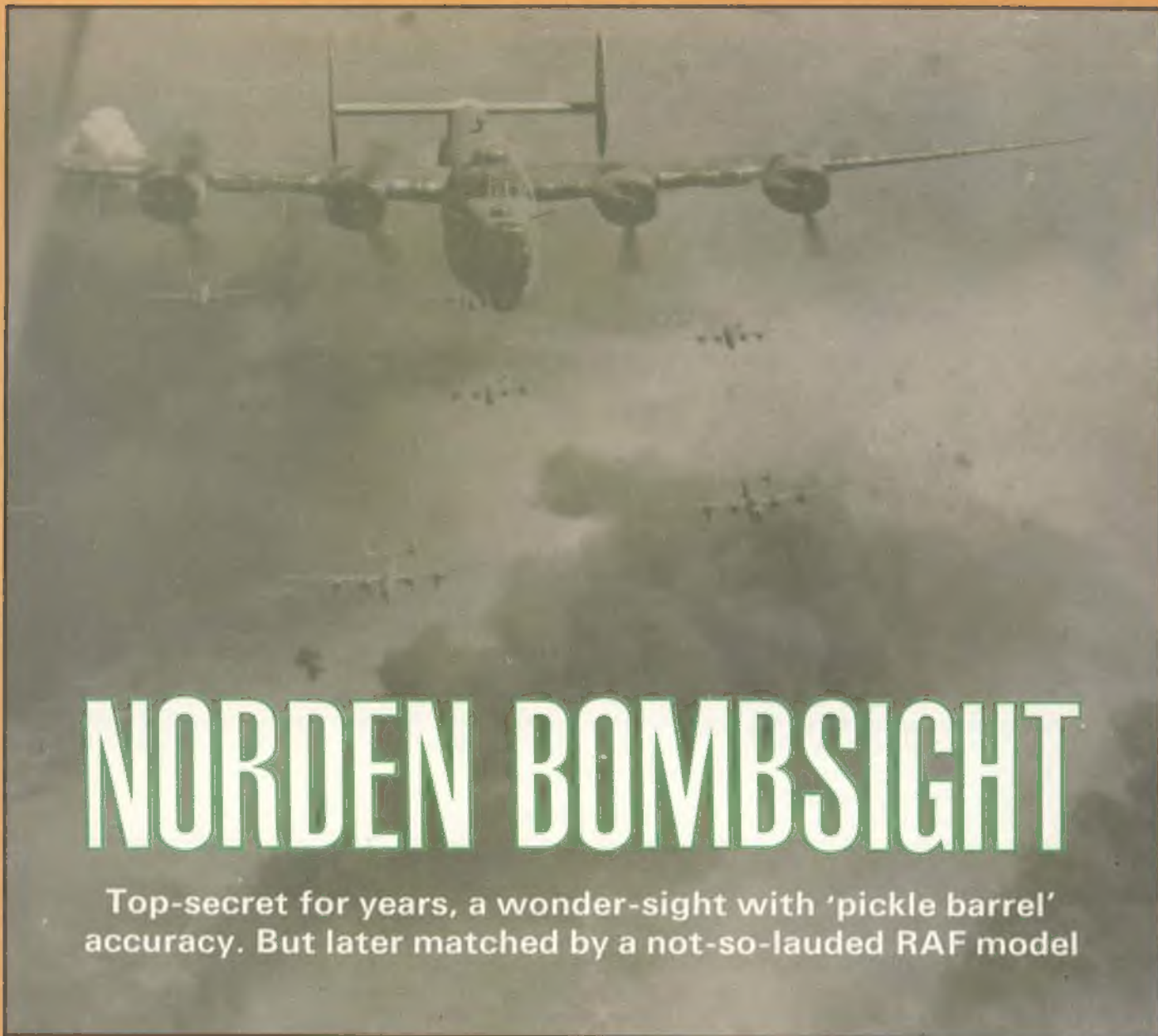
MacClancy

A B17, its port tailplane
destroyed by a falling bomb.
Read 'Big Week' next month.

CONTENTS

- 1 Norden Bombsight..... Gary Craig
- 10 Admin Box 1943..... Patrick Turnbull
- 18 Sea Mines 1914-45..... Donald Macintyre
- 26 'Bale Out!'..... Paul Hutchinson
- 34 Gorlice-Tarnow 1915..... Ward Rutherford
- 42 Castro Takes Cuba..... Kenneth Mansfield





Official USAF Photo

NORDEN BOMBSIGHT

Top-secret for years, a wonder-sight with 'pickle barrel' accuracy. But later matched by a not-so-lauded RAF model

With flak bursting off-target, B24 Liberators bomb the Concordia Vega oil refinery at Ploesti, Rumania, on 31 May 1944. This raid, by the 15th USAAF, was by 460 heavy bombers as part of a concentrated offensive against German oil plants.

When the highly trained young bomber crews of the United States 8th Air Force began arriving in England in the summer of 1942 they brought with them an unshakeable faith in the concept of high-altitude daylight strategic bombing. Battle-hardened veterans of the RAF shook their heads in disbelief. The British had been forced to abandon daylight bombing early in the war when formations were cut to pieces by German fighters. The *Luftwaffe* learnt a similarly expensive lesson during the Battle of Britain. Night raids certainly reduced bomber losses to manageable proportions, but accuracy left a lot to be desired, even when attacks were carried out at altitudes of below 10,000ft. As British bomber strength grew so the practice of area bombing was born—blanketing whole sections of a city with bombs, so that high-precision aiming was not necessary.

Only by sending out bombers in daylight, the Americans asserted, was it possible to pin-point the important targets—factories and military installations. And they planned to

go in at over 20,000ft, where they would be less vulnerable to AA fire.

The vital factor upon which this revolutionary strategy depended was the top-secret Norden bombsight. Without this complex device it would have been ridiculous to even consider precision bombing from four miles high, with the additional problems posed by cross winds and the need to take evasive action in the face of flak and defending fighters.

Three years later, in the spring of 1945, Germany lay in ruins. From Kiel in the north to Munich in the south her cities had been reduced to heaps of rubble. As the war neared its end, the RAF were regularly sending out 1,000-strong raids. There can be no doubt of the efficiency with which the British obliterated Hamburg, Cologne, Dresden and a dozen other cities—including, eventually, Berlin itself. But when Albert Speer, the Nazi Armaments and War Production Minister, was interrogated after the war he affirmed that the mass daylight attacks were the most

effective in weakening the German war effort because they 'were based upon economic considerations and inflicted heavy damage on precise targets'. It was the Norden bombsight which made this vital American contribution to the Allied victory possible.

The origins of this piece of equipment can be traced back to 1921, when the US Navy asked consulting engineer Carl L. Norden, a Dutch-born authority on gyroscopes, to devise a gyro-stabilized base for their existing Mark 3 bombsight so that it could be used from high altitude.

The device that Norden evolved worked perfectly well as long as the target was stationary. Unfortunately, enemy ships are rarely obliging enough to remain at anchor when attacked. The Navy accordingly asked for a more refined bombsight still. One that could be used against moving targets.

This was a much more complicated problem than just providing a stabilizer for an existing sight. Norden enlisted the services of an engineer, Theodore Harold Barth, and an officer from the US Navy Bureau of Ordnance, Lieutenant-Commander Frederick I. Entwistle, and set to work.

Early beginnings

The Mark 11 gyro-optical sight was developed in 1924. It incorporated a timing device to indicate the correct moment for bomb release. But this was only a beginning. And the Mark 11 sight was not ready for testing at the Naval Proving Ground, Dahlgren, Virginia until 1928. It was installed in a Martin bomber and a Naval flier, J. J. Ballentine, was detailed to make the first practice drop using the new sight. Unfortunately, no allowance had been made for the very low temperatures experienced at altitude. The day of the test was particularly cold. The components of the delicate sight had been toleranced in the warmth of the laboratory. When Ballentine began his run he found that the device was completely frozen up. To an experienced experimental flier like Ballentine, test bombing runs were routine and he decided not to disappoint Carl Norden, who was watching on the ground. He made the drop, with excellent results—by rule of thumb!

Ballentine landed and climbed cheerfully from the bomber, only to be met by a downcast Carl Norden: 'Bally, you don't have to tell me. The sight didn't work. You dropped those bombs by eye!'

Norden did not admit defeat easily, however, and he soon overcame the inevitable problems of a new piece of complicated equipment. In 1929 the Mark 11 sight was yielding 50 per cent better results than the old Mark 3 and the Navy ordered 80 examples.

Despite the accuracy attainable with the Mark 11 the Navy was not happy with the complexity of the instrument and there were misgivings about its operational requirements. The timing mechanism required the aircraft's speed during a bomb run to be established at a substantial distance from the target and accurately maintained throughout a long approach. In battle, a bomber would be a sitting duck for defending fighters and AA fire whilst on the run-up, and even without these hazards the pilot's skill would be at a premium to keep to a constant speed and hold the plane absolutely level.

Carl Norden went back to work. A new company—Carl L. Norden Inc.—was founded in New York City in 1928. By 1931 another new bombsight was ready—the famous Mark 15. With this instrument the closing speed of the attack could be established at any time during the

run-up and although a long steady approach was still necessary, a fixed speed and altitude had only to be maintained for 15 or 20 seconds.

The Mark 15 was tested against the hulk of the old heavy cruiser *Pittsburgh* in 1931 and the results so impressed the US Army that they placed an order for the new sight on top of what the Navy needed.

One more refinement was necessary before the Mark 15 became the war-winner of 1941/45. No pilot, however skilful, can fly with complete accuracy because he is constantly correcting for drift, checking his altitude, adjusting his airspeed and making innumerable minor alterations to his control settings. Together, these fluctuations have an adverse effect on bombing accuracy, and the greater the altitude from which the bombs are dropped, the wider the error becomes by the time they hit the ground.

To ensure the smoothest possible flying conditions on a bombing run, Norden devised a gyro-stabilized automatic pilot, known as Stabilized Bombing Approach Equipment (SBAE) to the Navy and Automatic Flight Control Equipment (AFCE) to the Army. This took over control of the aircraft on the run-in and eliminated the roughness of manual flying. It was now possible for any service aircrew to bomb with an accuracy that only the specialists at the Naval proving ground had been able to achieve before. From four miles above the dry lake at Muroc, California, Army fliers found that they were consistently dropping their bombs within 50ft of a practice target. These feats were enthusiastically referred to as 'pickle-barrel accuracy', and as a result American bomber crews acquired a reputation for being able to lob a bomb into a pickle-barrel from 20,000ft.

The final form

In its final form the Norden bombsight weighed 45lb and incorporated over 2,000 components. The stabilizer consisted of two electric gyros, one of which was set up to detect deviation from the aircraft's set course (the directional gyro), whilst the other registered any tendency to either roll or to nose-up or nose-down (the flight gyro). The sight was mounted on top of the stabilizer and was fitted with a 2.5 power telescope driven by a variable speed electric motor; a computer consisting of innumerable cams, gears, prisms, lenses and mirrors; and a gyro to hold the sight stable.

Before the Norden sight could be used the bombardier had to feed certain basic data into its computer. From pre-calculated tables he would get the time the bombs would take to fall (based on the speed and altitude scheduled for the run-in), and the distance behind the plane that the bombs would hit the ground (known as the trail). About five minutes out from the target the plane's drift was checked to find out if there was a cross wind. This factor had also to be fed into the computer. As the target came into view the bombardier trained the telescope on it and adjusted the telescope drive so that the instrument maintained its alignment with the objective.

When the clutches that controlled the bombsight were operated to activate the instrument, the stabilizer-controlled auto-pilot system immediately cut in. The directional gyro and the flight gyro both had electrical brushes fitted to them. If the plane moved off course, the gyro retained its orientation and consequently moved inside its housing. The brushes then made contact with solenoids that engaged electric servo motors which in turn operated the control



Official USAF Photo



surfaces and rectified the deviation. There was normally a link between the rudder and aileron servo motors to give bank in turns, but a special switch could be thrown that left all directional control to the rudder and eliminated bank.

The bombardier was able to manipulate the stabilizer to take evasive action in heavy flak, although there were mechanical stops in the auto-pilot that made steep banks impossible. Once the bomb run proper began, however, the plane was held rigidly straight and level by the stabilizer. The telescope tracked the target in until it reached the critical dropping angle, when the bombs were released automatically.

The complex computer made it possible to allow for any drift affecting the plane, as well as influencing the bombs during their fall. Moving targets could be hit as easily as stationary ones, since it did not matter if any apparent

Real John Wayne stuff as gun-toting aircrew of the USAAF escort their Norden bombsight to the bomber. Censorship has obliterated the flat perspex bomb-aimer's panel. The aircraft is a Douglas B18A, military version of the DC2.

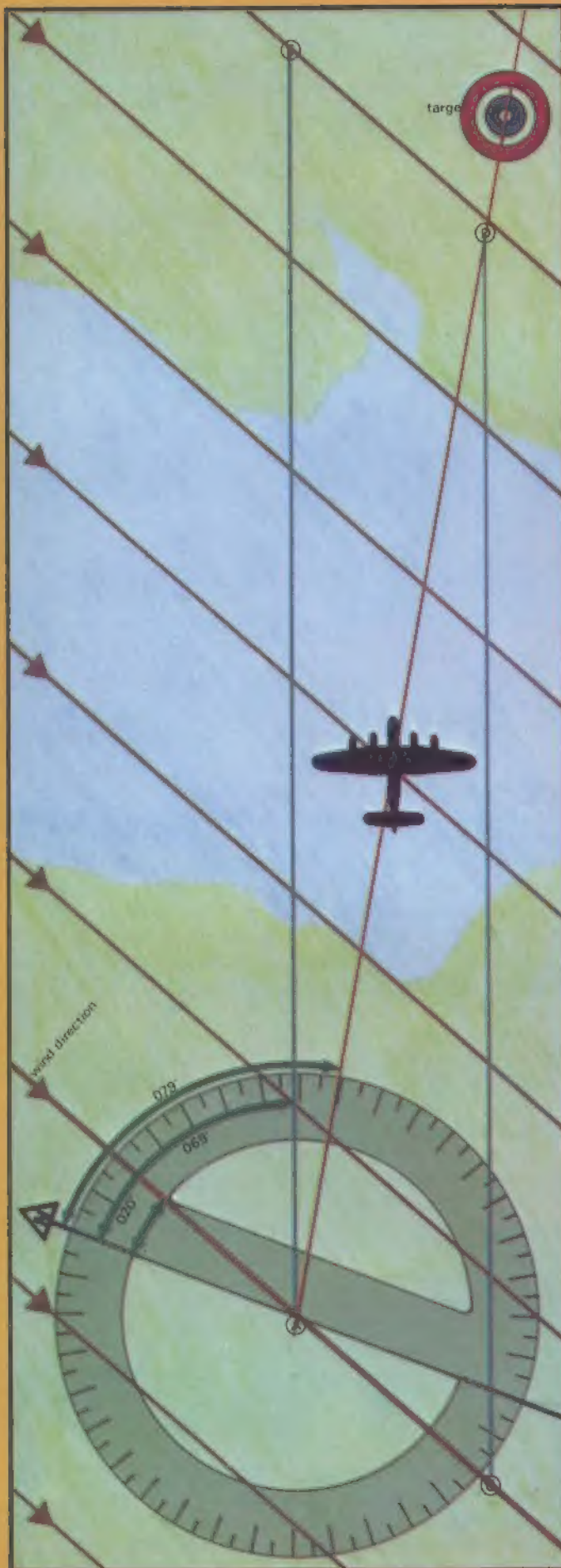
movement of the objective relative to the bomber was caused by a cross wind or by the mobility of the target.

There was only one serious fault with the Norden bombsight. It could not be used below 1,800ft. Attempts to adapt it for low-level use failed. This meant that it was of limited value to the Navy, who were principally required to undertake low-level strikes and dive bombing. When production really began to gather momentum in 1940 under the spur of an escalating European war, it was to the Army that most Norden sights were sent. The B17 Flying Fortress, the B24 Liberator, the B25 Mitchell, the B26 Marauder and the A20 Havoc were among the aircraft into which the sight was to be fitted. The small numbers sent to the Navy were earmarked for the PBM Mariner, PB4Y Catalina, PB4Y Liberator, TBD Devastator and the TBF Avenger.

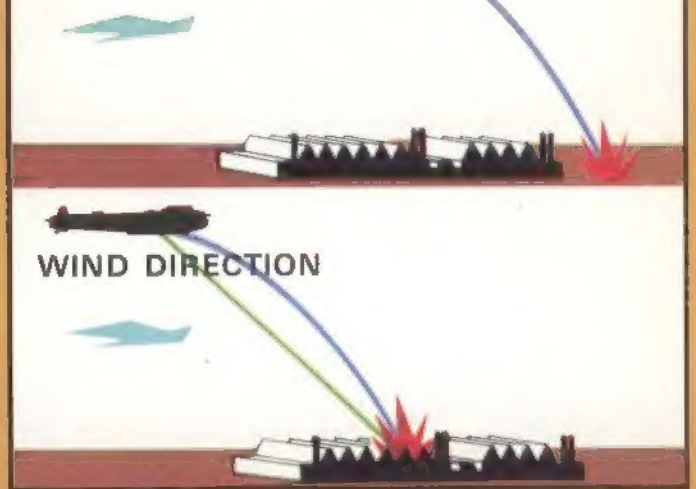
A new Naval ordnance plant was set up at Indianapolis to augment production from Norden's New York factory and an output of 800 bomb-sights a month was envisaged at the beginning of 1941. The Japanese attack on Pearl Harbor in December 1941 meant a drastic upgrading of that figure. Extra production sites had to be found, and contracts were placed with commercial firms that had suitable manufacturing facilities. Towards the end of 1943 output reached almost 2,000 sights a month.

Blanket security surrounded the Mark 15 bombsights when they entered service. They were never left unattended in aircraft. After every mission they were unshipped for storage in air-conditioned dust-proof vaults surrounded by high barbed-wire fences under constant guard. When a sight was needed for action it was carried to the aircraft by two armed servicemen. The canvas cover shrouding the device was not removed until the bomber was airborne.

On its very first missions from England in the summer of



WIND DIRECTION



WIND DIRECTION

△ A bomb from an aircraft right above a target will miss. When fed with the ballistic data, altitude, speed, drift angle, the Norden automatically released the bomb when the target reached the critical angle in the sight.

▽ Wind speed and direction affect an aircraft's movement over the ground. On the map the bomber is on track from A to target. Wind (a moving air-mass) from 020° at 40mph (A-C) will take the aircraft away from target and reduce its speed over the ground to 175mph (A-D) even though its air-speed indicator will show 200mph. To reach the target the bomber must head on a compass course of 069° (A-E).

▽ The navigator found his drift with a drift-sight. When markings on the ground ran parallel to wires in the sight the angle of drift was read from the scale on the rim. Angle of drift is the angle at which the aircraft is pointed in comparison with its track over the ground.

COMPASS COURSE 090



1942 the US 8th Air Force was detailed to attack pin-point targets such as the locomotive workshops at Rouen marshalling yards, the *Luftwaffe* servicing base at Romilly-sur-Seine, and the submarine pens at St. Nazaire, Brest and Lorient, using the Norden sight to bomb from four miles up.

The British-based Fortress outfits soon discovered that allowing each plane in a squadron to maneuver independently to drop its bombs was likely to break up the defensive formation intended to give American air gunners maximum mutual protection from German fighters—as well as increasing the risk of collisions and creating general confusion. Colonel Curtis Le May, commander of the 305th Bomb Group, decided that only the lead ship in each formation should line up on the target, the rest of the bombers unloading when they saw their leader drop. The best crews and the most skilled bombardiers were assigned to fly in the lead planes.

This new idea worked well, and reduced the likelihood of poor bombing by inexperienced crews, such as occurred on 5 September 1942 when 140 French civilians died during a raid on the Rouen marshalling yards as a result of bombs falling wide of the target. This kind of incident gave the German propaganda ministry a sturdy stick with which to beat the Allies.

Bombing accuracy was computed by assessing the proportion of hits falling within 1,000ft and 2,000ft circles about an MPI (mean point of impact). To achieve a perfect strike, a group would have to unload all its bombs within the 1,000ft circle. By the spring of 1943 some impressive results were being recorded. Over Vegesack on 18 March, for instance, the 305th Group dropped 76 per cent of its load within the 1,000ft ring. On this raid the 8th Air Force earned its first Congressional Medal of Honor, awarded to 1st Lieutenant Jack Mathis—lead bombardier of the 359th Squadron. Flying at 24,000ft with only a minute to go before reaching the dropping point, Mathis was peering intently through his Norden sight when an AA shell exploded just to the right of the B17's nose. Fragments shattered the plexiglass and hurled Mathis 9ft to the back of the compartment, almost severing his right arm and inflicting mortal wounds to his body. He somehow managed to drag himself back to his sight and released the bombs—the signal for the rest of the squadron to unload—but as he reached for the switch that closed the bomb bay doors he collapsed and died.

First time out for AFCE

The Vegesack mission was also the first raid on which the AFCE (automatic flight control equipment) had successfully been employed. Early difficulties with this device were overcome by judicious modifications and most group lead bombers subsequently carried AFCE. But crews never regarded it as infallible despite its pre-war use on long-distance seaplane flights from San Diego to the Panama Canal Zone and from San Francisco to Honolulu.

In the Pacific, the B24 Liberators of the 7th Air Force were carrying out missions involving nearly 3,000 miles of trans-ocean flying, with targets that were frequently no bigger than a radio station, such as the one on Rongelap in the Marshall Islands that was housed in a building only 35ft by 125ft. On that occasion the B24s went in at 3,500ft and used only 100lb bombs—relying on the accuracy of their Norden bombsights to accomplish the destruction of the Japanese communications center. During the Marshalls

campaign of early 1944 the 7th Air Force claimed that 92 per cent of its bombs landed on the selected targets.

Over northern Europe the Americans encountered a problem. Mission after mission was scrapped or aborted as successive weather fronts from the Atlantic moved across the British Isles and heavy cloud obscured the sky. Not even the Norden bombsight could overcome this problem. The only answer was radar.

In such remote theaters of war as China and the Aleutians the Norden revolutionized aerial bombardment. When American forces occupied Kiska and Attu islands at the western end of the Aleutian chain in 1943 they found the Japanese installations in ruins as a result of accurate bombing. The defenders were forced to take refuge in caves. At Kiska, US bombers went over at 18,000ft.

Even from this altitude they succeeded in rendering the Japanese runway unusable and destroyed an oil dump, knocking out as well most of the AA gun emplacements and sinking shipping in the harbor.

'Blue Ox' proves itself

Conditions in China posed particular problems for high-altitude bomber crews. Targets were usually small and widely dispersed. The weather was anything but helpful, with heavy cloud, buffeting winds that gusted at up to 100mph, tropical heat at ground level, and sub-zero temperatures four miles high. The Norden sight, by now popularly known to American fliers as the 'blue ox', proved equal to all the demands made on it.

By mid-1943 American bombers based in England were thrusting deep into the Reich itself. In July the Continental Gumi-Weke factory at Hanover was attacked by B17s that in some cases went in at heights of over 30,000ft but bombed with such accuracy that 21 direct hits were scored—slashing production of tyres and synthetic rubber at the plant by almost 25 per cent for many weeks to come. Orders for the raid on the Messerschmitt factory at Regensburg on 17 August specified bombing heights of only 17,000 to 19,000ft to ensure maximum accuracy. The 390th Bombardment Group dropped 58 per cent of their bombs within 1,000ft of the aiming point and 94 per cent within 2,000ft, leaving the target hidden beneath a pall of smoke and flames. Most of the fuselage jigs for the new Messerschmitt 262 jet fighter were destroyed by this strike.

Still lower bombing altitudes of 11,000 to 13,000ft were stipulated for a raid on the Focke-Wulf factory at Marienburg during October. The AA defenses were known to be weak here. Results were again good, with 58 per cent within 1,000ft of the aiming point and 83 per cent inside the 2,000ft circle.

Dense cloud severely restricted American air operations over Europe during the winter of 1943-44. Those bomber missions that were carried out depended heavily on the use of pathfinder aircraft equipped with radar. A brief break in the weather on 11 January allowed 650 bombers to be sent to the Brunswick area, where the Messerschmitt 110 factory at Waggum was subjected to concentrated visual bombing. The 94th Bombardment Group's 20 B17s had 73 per cent of their bombs land within 1,000ft of the aiming point and not one of them beyond 2,000ft.

Towards the end of February the skies began to clear and the Norden bombsight came into its own again, with objectives as far afield as Berlin appearing regularly on target schedules from early March.

The Allied invasion of Europe in June 1944 meant the



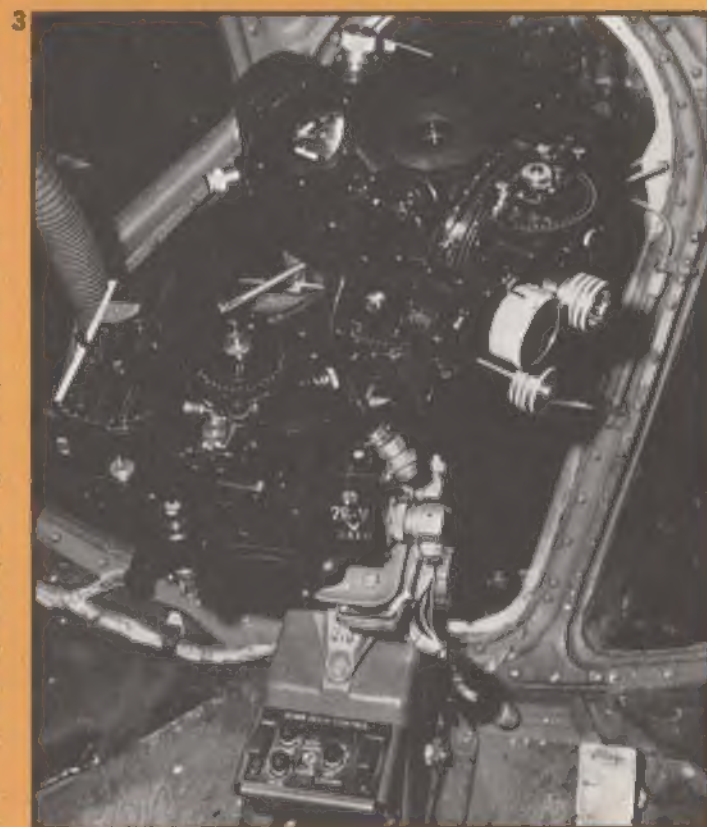
diversion of Anglo-American air power to tactical targets in support of the armies battling their way ashore in Normandy. US heavy bombers used their Nordens to good effect in attacks on fortifications, roads, railways, and the launching sites from which the Nazis were directing pilotless flying bombs (V1s) and giant rocket projectiles (V2s) against England.

By April 1945 Germany was on the point of total collapse and the European war was drawing rapidly to its close. US 8th Air Force B24s of the crack 467th Group set a new standard for precision bombing. Detailed to destroy a German battery still holding out at Pointe de Grave, on the west coast of France, the three Liberator squadrons scored a 100 per cent strike—every bomb within 1,000ft of the MPI. Half of these were within 500ft.

Norden sights were inevitably captured by the Germans and the Japanese. Early in the Pacific war it had been possible to send a special US Navy recovery team to a coral atoll south of Hawaii just to salvage a Catalina flying boat—sunk with a Mark 15 sight installed. The plane was dragged up with grappling hooks, the sight was systematically smashed, and the wreckage returned to the sea bed. By the end of 1943, however, the Americans were losing as many as 60 four-engined bombers on a single mission over Europe, and the Norden sight was standard equipment in B17s and B24s.

The complexity of the Norden was such that American experts believed the Germans would need two years at least to unravel its mysteries and set up production facilities for manufacturing a copy.

In fact the *Luftwaffe* never developed a long-range high-altitude strategic bomber force, and consequently had no real need for a sight like the Norden. At the beginning of World War II the German air force had the fully automatic, electrically-driven Goerz release (G-A) sight. This was fitted with a heating device for use in cold climates or at high altitude and could drop a stick of bombs across a



target from any chosen point.

In the summer of 1940 the standard sight used by German twin-engined bombers was the pendulum-stabilized LOTFE 7B, but this was being replaced during the Battle of Britain by the 7C, which had a pendulum-controlled gyroscope. All 7B sights were gradually returned to the Zeiss factory at Jena for modifying to 7C standard. The appearance of this new aid to bombing caused mild con-

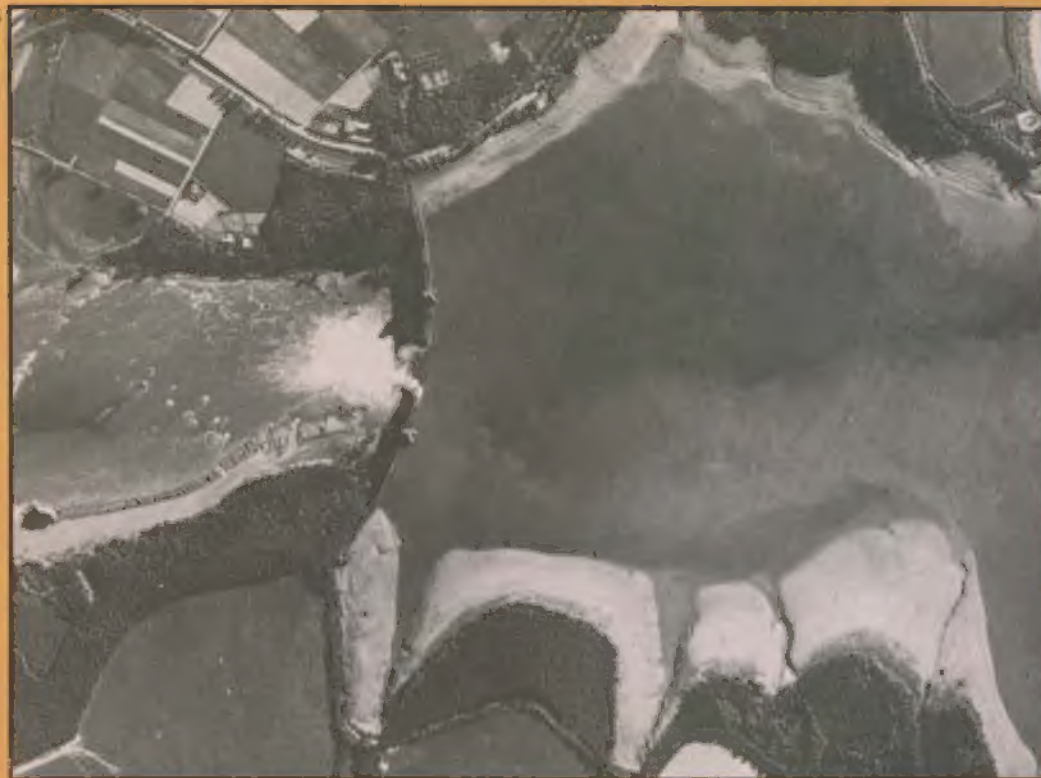
1 Over 40 per cent of all Luftwaffe Me 109Gs were produced at Messerschmitt's main factory at Augsburg, situated in a bend of the Danube near the Austrian border.

2 On 17 August 1943, B17s struck, their Norden sights placing the bombs where they would do the most damage. The aircraft then flew on to North Africa.

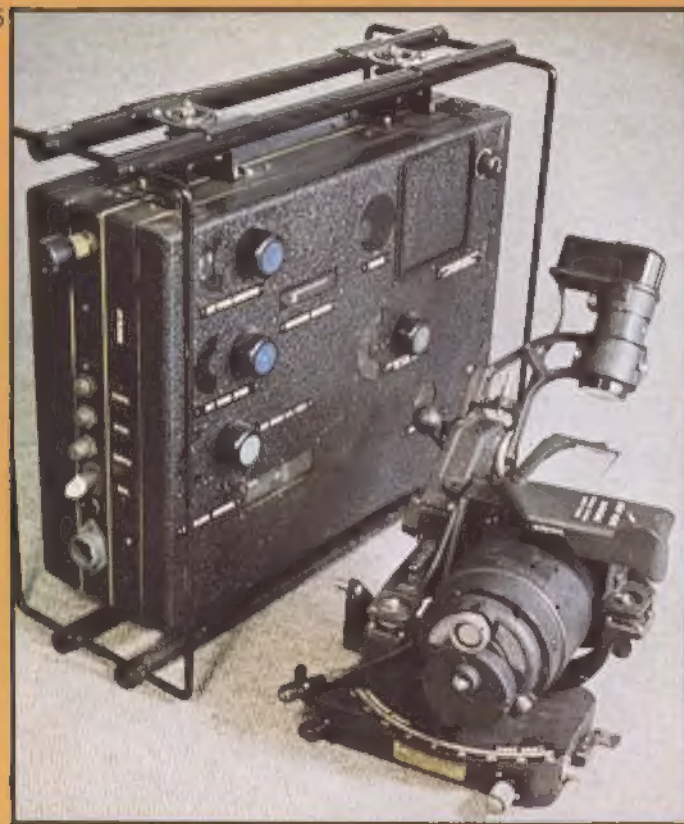
3 The Norden bombsight installed.

4 A low-level target not suitable for the high-level Norden. The Moehne Dam, hit by the RAF's 617 Sqdn (the 'Dam Busters') on 17 May 1943.

5 The RAF's Mk XIVA, also used by 617 Sqdn. It could be operated even if the bomber was taking evasive action. Its operational ceiling was 25,000ft.



Imperial War Museum



W. Howes

sternation in Britain. Rumors of it reached the Prime Minister's office in July 1940 and Winston Churchill demanded a report on a 7C found in a crashed Heinkel 111. Experts at the Royal Aeronautical Establishment, Farnborough, Hampshire, rebuilt the badly damaged sight and reported unfavorably upon it because the gyroscope proved uncontrollable. Nevertheless, the Zeiss works was listed as a primary target for RAF Bomber Command as

soon as the nights became long enough for bomber operations in the autumn of 1940.

Early in 1945 a Zeiss bombsight fell into Allied hands. The influence of the Norden was evident. This electrically and mechanically operated device apparently controlled the plane during a bombing run, but in the absence of any German strategic bombing capability it must have been of small value to the *Luftwaffe*.

The RAF used a similar bombsight to the Norden, known as the Mark III SABS (Stabilized Automatic Bombsight). This was developed between 1938-41 but was eventually used almost exclusively by No 617 Squadron (the famous 'Dam Busters'), who were reserved for special precision bombing missions after their Lancasters were equipped with the Mark IIA sight during the latter part of 1943.

The area bombing technique favored by the RAF did not require a precision sight and could be adequately undertaken with the British Mark XIV bombsight, a continuously-set vector sight with a remotely stowed mechanical computer that relayed the drift angle and bombing angle to a sighting head in front of the bombardier. The operational limits of the Mark XIV were 1,000 to 20,000ft and 120 to 300mph, but wind speed and direction had to be accurately known as these factors were fed into the computer and incorrect data resulted in substantial errors. Bombsights based on the tachometric principle (such as the British Mark IIA) compute wind velocity and direction automatically during the aiming process.

The Mark XIVA represented a more refined development of the vector-type bomb-sight and was widely used by the RAF in both Bomber and Coastal Commands. It embodied a barometric altimeter, which imposed a ceiling of 25,000ft on its use, and there was still the problem of ensuring that wind speed and direction were correctly assessed, but the Mark XIVA could be operated even if a bomber was banking to avoid flak or fighters, whereas



Official USAF Photo



Off. U.S. Air Force Photo

The official caption to this photograph says one wing of this B17 over Berlin is on fire. But the shape, color and turbulence of the 'smoke' suggests that it is no more than a condensation trail caused by expanding exhaust gases from the bomber's engines

A column of smoke, thousands of feet high, as evidenced by its shadow on the ground, rises from the site of an oil refinery at Dortmund, Germany. Using the Norden bombsight, US 8th Air Force B17 Fortresses hit the target fair and square. Two strings of bombs can be seen on their way, with white markers streaming down for following bombers. Old bomb craters pock-mark the ground from previous raids.

the Mark 11A SABS demanded a straight and level bombing run of at least 20 seconds

No 9 Squadron, RAF, became a similar 'special mission' unit to No 617, but No 9's Lancasters used Mark XIVA sights. It was found that No 617's bombing was marginally more accurate than No 9's, but the SABS sight had to be set up by an expert from the Royal Aeronautical Establishment, needed very skilled bombardiers to operate it efficiently, and could really only be employed on lightly defended targets if prohibitive losses in highly trained crews were not to be suffered. Evasive action on the last stages of the bombing run was not possible. The SABS sight could be used from 5,000 to 25,000ft, but was not tropicalized for hot climates and had limited value for night bombing. But it was more accurate than the Mark XIVA against moving targets taking little or no evasive action

Comparative tests between the Norden and the Mark IIA carried out by RAF Group Captain Leonard Cheshire indicated that the Mark IIA required a shorter run-in time to the target and the RAF assessors expressed a preference for the British sight which they considered more efficient than its American counterpart.

In the Pacific the Norden sight was to play a vital part in the closing stages of the war against Japan. With US forces established on the Mariana Islands in mid-1944, the giant new B29 Superfortress bombers, equipped with M-series sights, were within comfortable striking distance of the Japanese homeland and an intensive bombing offensive began to gather momentum.

The B29s were bombing from as much as 30,000ft and at that height over Japan strong jet-stream winds blowing at 120 knots seriously affected bombing accuracy. Eventually the B29s were stripped of their guns and sent in at night with incendiaries to burn-out the highly inflammable Japanese cities.

Into 500ft circle from 30,000ft

One Superfortress outfit became a specially trained elite force. The 509th Composite Group of the 315th Bombardment Wing had been activated at Wendover Army Air Field, Utah, in December 1944. Their planes were specially prepared B29s, without gun turrets, that were maintained to meticulous engineering standards (the unit never lost a single Superfortress either in training or in actual combat)

Under their commanding officer, Colonel Paul W Tibbets Jr., the bombardiers of the 509th learnt how to use their Nordens to drop their bombs within a 500ft circle from 30,000ft

After final training in Cuba the 509th moved to Tinian in May and June 1945. The activities of this top-secret group were a mystery even to other B29 units in the Marianas. There was a good reason for the stringent security. On 6 August one of the 509th Group's special B29s dropped the first atomic bomb on Hiroshima from an altitude of 31,600ft. Three days later the Group dropped a second nuclear weapon on Nagasaki. Conditions were so bad that it had been decided to bomb by radar, ignoring orders specifying a visual drop. The big Boeing was brought in blind and on instruments, but just seconds before reaching the release point the clouds opened up. Control was instantly handed over to the bombardier, who unleashed the massive bomb that seconds later devastated the heart of Nagasaki

Within days of the second nuclear strike Japan sued for peace. The Norden bombsight had played a vital role in the two decisive bombing missions that effectively ended World War II. Production of the M-series sight finally ceased in September 1945, 43,292 having been manufactured at a cost of \$500,000,000. All but 6,434 of them went to the Army.

Not until 1955 was the security blanket on the famous Norden sight at last lifted. By then it had been superseded by later developments and Carl Norden was allowed to take out a patent on his invention—something that had been impossible for him to do during the secrecy of the war years, although the design had been filed with the US Patent Office way back in 1930. Anyone could now buy a copy of the plans for a mere 25 cents. It was not long before stores selling government surplus goods were offering actual Norden bombsights for just \$50!

Gary Craig



ADMIN BOX 1943

**Operation 'Ha-Go' was only a prelude to the March on Delhi.
A 'minor skirmish', it spelt disaster for Japan's troops**

In the latter half of 1943, Lieutenant General Renya Mutaguchi, Japanese Fifteenth Army commander, and his divisional commanders, were summoned to a series of conferences at Lieutenant General M. Kawabe's Burma Area Army HQ in Rangoon. They were there to discuss operations for the coming year. The outcome of these meetings—held under considerable strain, since Tokyo had impressed on Kawabe the necessity for speedy victory in Burma to boost flagging morale at home—was the plan for an offensive—Operation *U-Go*—on the central Assam/Manipur front by Fifteenth Army. Its objective was the destruction of 4th Indian Corps, and an advance to the Bengal frontier. It was somewhat optimistically reckoned that success—and it was stressed that failure could not even be contemplated—would spark off a general uprising in India against the British Raj, and what Japanese propaganda was to refer to as 'The March on Delhi'.

But it was not until the general outline of *U-Go* had been approved by Southern Area Commander, Field Marshal Count Hisarichi Terauchi, that a rider for a preliminary, diversionary, operation in Arakan—code name *Ha-Go*—was added. To be carried out by 55th and elements of 54th Divisions under the recently arrived Lieutenant General Tadashi Hanaya, the object of this limited offensive was to pin down, and draw off, British-Indian reserves from the main central front.

Japanese hopes of a resounding victory in Burma seemed justified. Early in 1943, an attempt by 14th Indian Division to recapture the Arakan port of Akyab ended in ignominious failure. Though eventually expanded to six brigades, 14th Division had failed to break through the Japanese defenses on the Donbaik Chaung. This was at no time manned by more than two battalions and by as little as two companies to begin with. Finally, in early April, the recently arrived Japanese 55th Division staged a brilliant counter-attack, driving 14th Division and its replacement 26th Indian Division back well beyond their starting point.

At his Ranchi HQ, Lieutenant-General Sir William J. Slim, commanding 15th Indian Corps, who had been called to take charge of the Arakan battle too late to do other than convert a threatened route into an orderly withdrawal, was one of the very few not afflicted by the wave of pessimism following this disaster. The jungle, he insisted, was the reverse of the desert—infantry, not tanks and fighter-bombers dominated the battlefield. Therefore until the British copied the Japanese, and made the infantry the *corps d'élite*, there could be little or no hope of victory. Acting on his own theory, Slim devoted the Monsoon period to the intensive battle training of his reconstituted Corps, 5th and 7th Indian Divisions, commanded by Major-Generals Harold R. Briggs and Frank W. Messervy, both veterans of East Africa and the Western



◁△ 14th Army tank goes into action at Arakan. British troops in Burma called themselves the 'Forgotten Army' and were always 'last in the queue' when it came to supplies. This tank—the Lee-Grant M3 with rivetted hull—was obsolete in other theaters of war, but two squadrons of them (perhaps 30 tanks) were active in Admin Box. △ Men of the Royal Garhwal Rifles on reconnaissance patrol in the fetid jungle of Arakan.

▷ A view of the clearing in Admin Box from Ammunition Hill. Brigadier Evans was under orders to hold this clearing to the bitter end. This was a dangerous place to defend. Only 1,200 yards across, it was all in rifle range.



Desert, and Major-General C. G. Woolner's 81st West African Division. The Bihar jungle was the scene of tough exercises under active service conditions. Non-combatants—clerks, storemen, wireless operators, cooks—had to join in, warned by Slim that 'in the jungle every man, whatever his job, is likely to find himself engaged in hand-to-hand fighting with the enemy.'

When the 1943/44 dry season operational plans were made known, 15th Corps was gratified to learn that it was to be given the opportunity for a 'return match'. While in Manipur, 4th Corps' activities were to be confined to 'a limited offensive up to the Chindwin', 15th Corps was entrusted with the job of clearing the enemy forces from Arakan, and (possibly) to follow up with the capture of Akyab.

As the Monsoon abated, 15th Corps left Ranchi *en route* for Arakan, but within a few days of setting up his HQ at Bawli Bazar, Slim was called upon to command the newly created Fourteenth Army. His place was taken by Lieutenant-General Philip Christison from 33rd Corps in Southern India.

Arakan's terrain, as 14th Division had found to its cost, heavily favored the defense. A narrow strip oriented N-S, it is bounded on the east by almost trackless jungle-covered hills, the Arakan Yomas and Arakan Hill Tracts, on the west by the Bay of Bengal. What flat ground there is consists of *padi* fields and swamps, furrowed by wide, swift-flowing rivers, and tidal creeks. The Mayu Peninsula, ending at Foul Point opposite Akyab Island, is bisected by a dragon-crested spine of hills, the Mayu Range. Its precipitous jungle slopes rise to 2,500ft in places, crossed E-W by only three passes. The Goppe and Ngakyedauk Passes were barely fit for mules. But the Tunnels Road was suitable for mechanical transport. This was formerly the track of a narrow-gauge railway connecting the little port of Maungdaw on the west, at the mouth of the Naf river, with Buthidaung on the east, at the point where the tidal Mayu River became the Kalapanzin, and cutting through

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the range by two short tunnels. This road—16 miles in length—was the line on which Lt. Gen. Hanaya had chosen to base his main defenses, giving the whole area the picturesque name of 'The Golden Fortress'.

Since the destruction of the Japanese, rather than territorial gain, was Christison's objective, this concentration of enemy forces suited him. Advance was on a two-divisional front, 5th Division to the west, 7th Division to the east of the Mayu Range. After making a wide sweep to the east the West Africans were moving on a pack basis down the Kaladan Valley, acting as a flank guard. Christison had met with only token resistance. By the New Year of 1944, he was poised for the first phase of his main attack; an assault on the Golden Fortress's western bastion, Razabil, just south of Maungdaw. The choice of Razabil as the first objective was dictated by the urgency of securing Maungdaw with its harbor facilities, since, till the port became operational, 15th Corps had to rely on a single supply line. This was a road on the west, coastal, side of the Mayu Range—built the year before by 14th Division's engineers.

In the first week of January, 161st Brigade (5th Division) began to probe the outer edges of the Razabil defensive network. They met such determined opposition that what was hoped would be the decisive blow could not be delivered until 26 January. Though preceded by heavy aerial and artillery bombardments, and supported by the Corps' armored unit—the 25th Dragoons in Lee-Grant medium tanks—hardly any progress was made. After three days of abortive assaults, heavy losses—the Sikh company of 1st Battalion, 1st Punjabi Regiment was reduced to 21 men, while the 4/7th Rajputs lost 27 killed and 129 wounded—Christison had to call a halt.

He planned to switch the main weight of his renewed offensive to 7th Division's front. With this in mind he ordered 25th Dragoons to move to the eastern side of the Mayu Range via the Ngakyedauk Pass, by then capable of taking heavy vehicles, thanks to superhuman efforts on the part of the engineers, since the track included a rise and fall of 1,000ft in three miles. It was renamed, and since immortalized, as the 'Okey-doke' Pass.

At the same time the eastern exit in the neighborhood of Sinzweya was converted into an administrative area, with petrol and ammunition dumps, vast stores of rations, spare parts, and medical supplies, manned by Ordnance, Service Corps, Transport and Medical units. Its defense against possible tip-and-run raids was entrusted to the 24th Light Anti-Aircraft/Anti-Tank Regiment, commanded by a peace-time solicitor, Lieutenant-Colonel R. B. 'King' Cole.

By 3 February the redeployment was almost complete. The offensive was fixed for 7 February. But unimpressed by the fact that he was outnumbered, and anxious to repeat his division's earlier triumph, Hanaya struck first.

For the tactical execution of *Ha-Go* he detailed a force of roughly 8,000 men under the command of Major-General T. Sakurai (commander of 55th Divisional Infantry Group; an appointment without equivalent in the British Army) which was split into three columns. Though the main striking force of these three was designated *Sakurai Column*, it was in fact led by Colonel S. Tanahashi. He was a dynamic officer who had played a major role in 14th Division's discomfiture. At the head of his own 112th Infantry Regiment, supported by an artillery and an engineer group, his task was to pass through the advanced posts of 114th Brigade (7th Division) strung out on the eastern bank of the Kalapanzin, capture Taung Bazar, then, crossing to the west bank, swing left and 'destroy the enemy forces between the Kalapanzin river and the Mayu Range'—the bulk of 7th Division.

While this was in progress, a smaller column of only one battalion under Colonel Tai Koba, marching rapidly north, was to make a left-wheel near the Goppe Pass, cross the Mayu Range, and establish a road block across 5th Division's lifeline—the Bawli Bazar-Maungdaw road. To pin down forward troops while these outflanking movements were being performed, two battalions, under Colonel Doi, were to mount a series of holding attacks along the entire front from the Kalapanzin to the sea.

Relying on the element of surprise, *Sakurai Column* took almost suicidal risks when it set out from Kindaung at 2300 on 3 February. In a solid phalanx, 16 men abreast, together with their mules, 112th Regiment marched down

◁ In the sweltering and humid undergrowth of the Arakan, Mahrattas form up in preparation for an attack on a position occupied by the Japanese. The operations that took place in Burma and the Far East were amongst the most gruelling and exhausting actions seen by any of the belligerents in World War II.

▷ Three men of the Tripura Rifles lie in wait in the jungles of Arakan to take a Japanese patrol by surprise. They are, from left to right: Major H. Dev of Agartala, Naik Rajandra Deb of Village Kawaban, Tripura and Rifleman Chandra Kishore of Village Majibasti, Tripura.



Imperial War Museum

a narrow valley, barely 400 yards wide, knowing that units of 114th Brigade were in positions on the ridges on either side. The gamble paid off, helped by the fact that the night was moonless and by a thick mist blanketing the valley. Brigade HQ reported hearing the sound of movement, of muffled voices and the clanking of mule accoutrements, but assumed that the sounds came from Royal Indian Army Service Corps supply columns taking advantage of the cover of darkness. As a result, the few troops installed in Taung Bazar were taken completely by surprise at first light, and wiped out.

By evening most of 112th Regiment had crossed to the west bank. There were indecisive skirmishes with elements of 89th Brigade, divisional reserve, the next day, but by 7 February Col. Tanahashi had reached the Ngakydeauk Pass. Meanwhile Col. Koba had descended on the coastal road near Briasco bridge, spanning the widest of the tidal *chaungs*, and overrun a Field Park and a Workshops Company. With only a weak battalion, Koba could not hold his ground. A morning counter-attack beat him back to the foothills after he had set fire to most of the vehicles and damaged the bridge. The vital road was soon re-opened, even though convoys were often under fire. Tanahashi on the other hand was soon firmly astride the Ngakydeauk, successfully separating 5th and 7th Divisions.

Christison appreciated from the start the primary importance of retaining the Sinzweya administrative area—from then on referred to as 'The Admin Box'. Having first directed 26th Indian Division, then in reserve at Chittagong, to move forward with all haste, he telephoned Maj.-Gen. Briggs of 5th Division instructing him to order 9th Brigade commander, Brigadier Geoffrey C. Evans, to move immediately with all his spare troops to the Box, and hold it to the last.

Even with the reinforcements Evans could count on in the next hour or so, the chances of holding out against attacks by crack Japanese troops, with a garrison composed mostly of non-combatants, seemed slender. Furthermore all advantages of the terrain lay with the attacker. Never foreseeing that it would become the scene of a major battle, it had been chosen for its flatness and absence of

scrub and jungle. Even so, the clearing measured a bare 1,200 yards in diameter. This meant that not a square inch would be out of range of small arms fire. It was a tactical trap; a bowl, the bottom naked, the sides and encircling rim densely covered in jungle. Ammunition dumps piled up at the foot of the western face of a central 150ft hillock—'Ammunition Hill'—were particularly vulnerable.

Evans realized that the defenders would be under direct observation, while the enemy could approach unseen to the edge of the perimeter from any direction. Again, although every man from storeman to cook and muleteer would have to take his place in the defenses, there would still not be enough to provide an unbroken line. Concentrating, therefore, on the most likely lines of enemy attack, Evans was obliged to leave the eastern and north eastern sectors dangerously open, counting on his mobile reserve—the veteran 2nd Battalion, The West Yorkshire Regiment, commanded by the experienced Lieutenant-Colonel 'Munshi' Cree, and two squadrons of the 25th Dragoons under their second-in-command, Major Hugh Ley.

Frantic digging was in progress when at 1430 on 6 February, a ragged group appeared from the jungle to the east. It was Maj.-Gen. Messervy, with a number of his staff. His 7th Division HQ had been overrun that morning. Throughout the afternoon more stragglers arrived, giving hair-raising accounts of their escape. By evening Messervy, in touch with his brigades, had resumed command, but had also made it clear that the defense of the Box was to remain in Evans's capable hands. At 1700 the latter called a conference of his commanders, to issue his orders. His instructions were brief—'Stay put and keep the Japanese out.'

By evening the garrison had been strengthened by the arrival of two companies of the 4/8th Gurkhas—the other two temporarily lost in the jungle—a mortar battery of 139th Field Regiment RA, and a battery of 6th Medium Regiment. A troop of the 8th (Belfast) Heavy Anti-Aircraft Regiment, and two batteries of the 24th Mountain Regiment were ordered to abandon their positions to go to the Box immediately.

During the afternoon there was a low-level attack by

Zero fighters, causing a number of casualties, but it was not until midnight that a first assault was delivered at a sector held by an Indian mule company. The muleteers—many of them Pathans—showed exemplary fighting discipline, holding their fire, unflustered by streams of tracer, until the yelling Japanese were almost on top of them. No determined attempt was made to press home the attack—possibly because no serious opposition had been expected.

The next day, the 7th, started badly. A patrol up the Ngakyedauk Pass was ambushed—making clear the fact that the Japanese had severed communications with 5th Division. Then, the two companies of the 4/8th Gurkhas, ordered to occupy a low jungle covered hillock dominating the 'eastern gate' of the Box (Point 315), were violently attacked before reaching their objective. Forced to give ground, their retreat was followed up by the Japanese who smashed through the perimeter—only to be halted by fire of the 25th Dragoons' 37mm and 75mm tank guns, then hurled back in confusion by 'D' Company of the West Yorkshires. The Gurkhas were later able to seize and dig in on part, but not all, of Point 315.

'Screams and cries for help'

The afternoon and evening were quiet, but in the early hours, Evans heard 'rifle and automatic fire . . . accompanied by screams and cries for help'. A Japanese raiding party had infiltrated the forward positions and entered the Box hospital. This had been set up in three widened and deepened dried-up *chaung* (Burmese name for a water-course) beds, at the foot of a hillock known as MDS Hill. The raiders' first act was to bayonet a number of the badly wounded as they lay helpless on their stretchers. Six doctors were then lined up and shot. An Indian doctor, Lieutenant Basu, escaped by smearing himself with blood and feigning death. When, at dawn, a counter-attack was organized, the survivors, wounded and medical staff alike were used as human shields to protect the retreating Japanese, only to be later murdered in cold blood.

Another crisis developed at first light on 9 February. During the night before the Japanese manhandled their 70mm infantry howitzers to the crest overlooking Ammunition Hill, and opened up on the ammunition dumps. Fires were soon raging and crates of .303in and 25pdr shells exploding with much the same effect as if the enemy had reached the center of the Box. Having recovered from the surprise, the Dragoons and the Belfast Heavy AA troop engaged the Japanese guns in an extraordinary artillery duel over open sights. As the Lee-Grant's 65mm (2 56in) armor was proof against 70mm shells, it was not long before the enemy batteries were silenced and the surviving crews killed by the West Yorkshires' bayonets. But the burning dumps continued to explode. It was not until late afternoon that the last fires were extinguished.

Early the next morning a partial revenge for the hospital murders was exacted. Regimental Sergeant-Major J. Maloney, 'B' Echelon, 9th Brigade, with a handful of HQ clerks, normally considered too old for combat, held a trench overlooking a dried-up *chaung*. At around 0200 the sound of approaching footsteps and voices was heard. Seconds later, about 50 Japanese headed by an officer came into view. Maloney held his fire until the enemy was level with his trench. Then, at his word of command, a volley of grenades and Sten submachine-gun bursts at point blank range wiped out the entire party. It was a minor victory all the more appreciated when it was found

that the dead men's packs were stuffed with hospital rations.

The first phase of the battle was over by 11 February. The Japanese had failed to destroy 5th and 7th Divisions. They had not even thrown them into confusion. On the other hand, rather than mopping up the Golden Fortress, 15th Corps was grimly battling for survival. Yet Christison had sound reason for optimism. Convoys, though sometimes under fire, flowed down the vital coastal road. The isolated *Koba Force*, driven back to the foothills, faced starvation. The Box, despite furious onslaughts, showed no sign of being swamped or running short of supplies. From the 10th the defenders were receiving all they needed, not only in the way of vital rations and munitions, but also such comparative luxuries as toothpaste, mail, rum and spare clothing, by air. Allied Troop Carrier Command's Dakota transports flew a total of 714 sorties, dropping 2,300 tons of supplies without which, starving, their guns silent, Evans's men might well have suffered the fate of Dien Bien Phu.

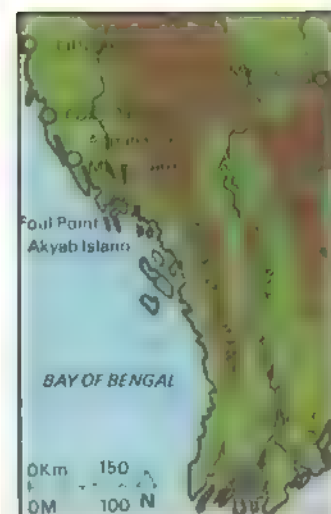
Over the rest of 7th Division area, the three brigades—114th, 33rd, and 89th—had dug themselves into subsidiary boxes, and though individually cut off were holding fast and hitting back hard. The advanced elements of 26th Indian Division were on contact with detachments of *Sakurai Column* north of Taung Bazar, while the army reserve, 36th Indian Division was at sea, *en route* from Calcutta to Chittagong.

At this stage, common sense dictated that Hanaya withdraw what was left of Sakurai's original force to the still intact Golden Fortress. His offensive has been halted. Soon his badly mauled regiments would be faced by no fewer than four divisions, two of them fresh to the battle. He had no armor, and the enemy was master of the skies. But he suffered from the besetting Japanese military sin—inflexibility. Once having issued an order, he could not tolerate the thought of modifying it. Furthermore his overconfident despatches had encouraged Toyko to broadcast —'It's all over in Burma'. Sakurai was ordered to press home his attacks with even greater vigor, an order with which he endeavored, loyally, to comply. From 10-18 February the fate of the Box often hung in the balance.

A major onslaught was directed at 'Artillery Hill', held by 24th LAA/AT Regiment, a bare 200 yards from Evans's HQ. Hidden by the jungle, the Japanese advanced to within yards of the gunners' trenches. Their first charge swamped the position, and a hastily organized counter-attack was thrown back.

Evans's brilliantly successful plan

By then Evans and his commanders had devised a plan for tank/infantry cooperation. It was to prove brilliantly successful. As the infantry left their starting position, the tanks saturated their objective with high explosive, until when, within assaulting distance, the infantry commander fired a Very light. This was the signal for the tanks to switch from HE to solid shot. The Japanese were still forced to keep their heads down, but as they pushed forward the attacking infantry were not exposed to fragmentation. The tanks were, therefore, able to keep up their fire until the leading sections, as close as 15 yards to the enemy, could make the final charge with grenade and bayonet, before the stunned Japanese had time to react. Employing these tactics, 'A' Company of the West Yorkshires, supported by a squadron of the Dragoons, retook 'Artillery Hill' by evening. Only 24 hours later this maneuver was repeated with equal success, after the Japanese had overrun 'C'



Map shows the terrain around Admin Box, the position of British-Indian and Japanese defense. Admin Box itself. The Japanese virtually surround the Box, of which every square inch is within range of small arms fire.

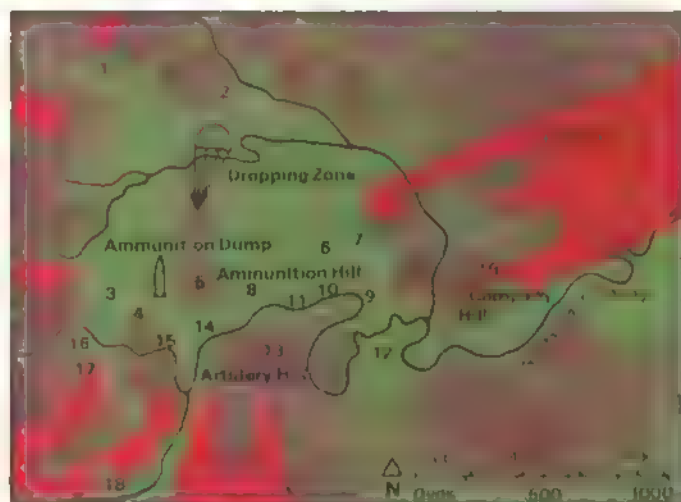
- 1 89th Ind Bde
- 2 43rd Ind Bde
- 3 1st Bde HAA Regt
- 4 1st Coy, 2nd Vt Yorks
- 5 Bty 24th L AA At Regt
- 6 Bty 6th Mtd Regt
- 7 Bty (mortars) 10th L Regt
- 8 Sq to 2 Bde 25th Div
- 9 7th Ind Bde
- 10 Officers' School
- 11 8th Ind Bde
- 12 89th Ind Bde
- 13 Bty 24th L AA At Regt
- 14 2nd Ind Bde
- 15 Bty 24th Mtd Regt
- 16 Hospital
- 17 7th Ind Div
- 18 9th Ind Bde
- 19 4th Bde

Company Hill, overlooking the eastern exit of the Pass

After 10 days of ceaseless harassment, Evans could congratulate himself that not one of the Box's main positions had fallen. But casualties were mounting alarmingly. Continuous night attacks, though not on a major scale, were achieving the dual purpose of stopping the exhausted defenders gaining any proper rest and necessitating a frightening expenditure of ammunition.

Efforts were also made to knock out the tanks which at night moved into laager—their MGs dismounted and laid on fixed lines. The most determined attack was launched at daybreak from Point 315. Caught in the open by the combined fire of tank guns and MGs, the Japanese were all slaughtered before covering half the distance.

Outside the Box, there were setbacks. On the 13th, the 2/1st Punjab and 4/7th Rajputs (123rd Brigade of 5th Division) overran the key to the Ngakyedauk Pass—the



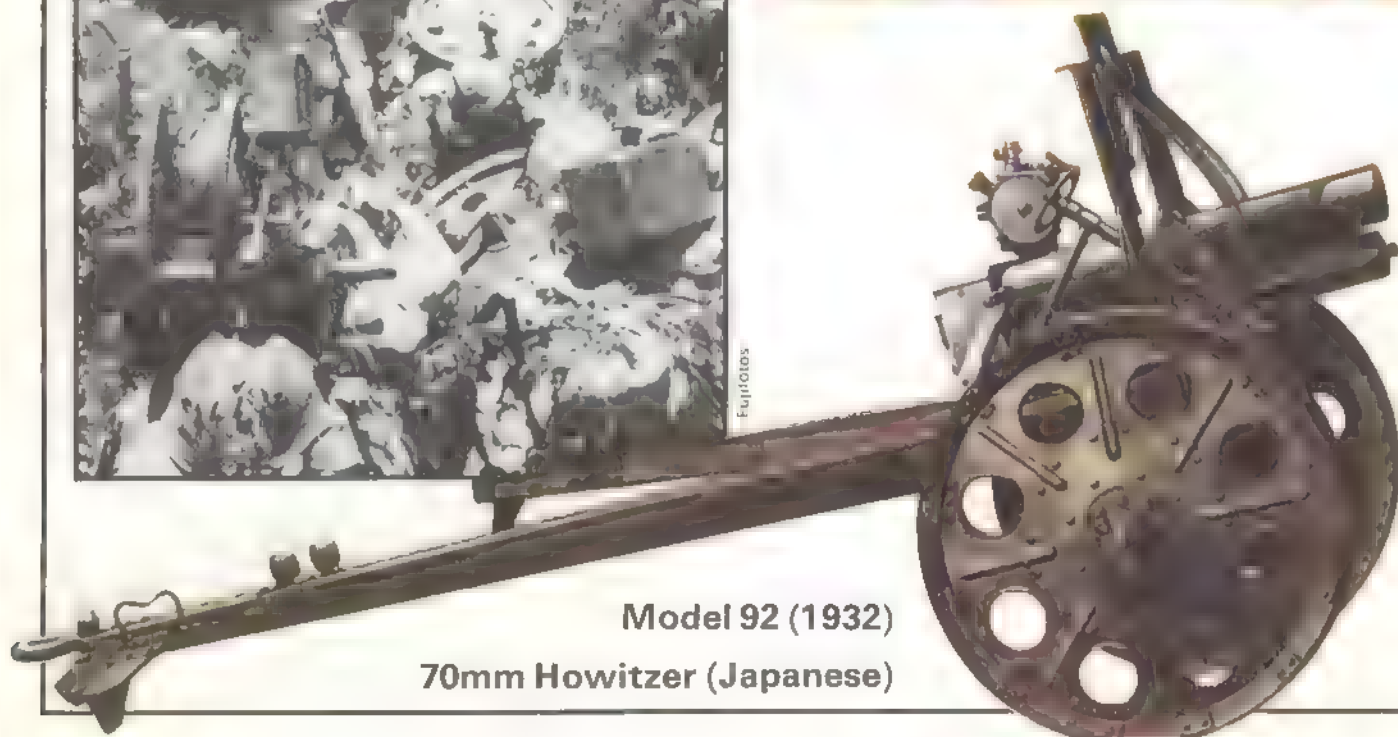
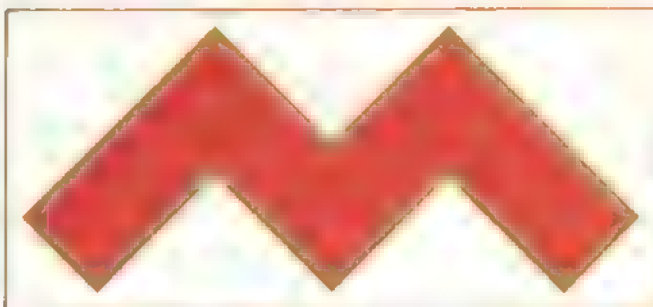
fortified hill feature Point 1070. It seemed the relief of the Box could be only a matter of hours. But during the night, the company of the 1/18th Royal Garwhal Rifles, ordered to hold the position, was subjected to continual *kamikaze* attacks. At dawn the survivors were hurled back down the slopes, leaving the feature firmly in enemy hands. On 10 February a gallant attempt by three companies of the 1st Lincolnshire Regiment (26th Division) failed to clear Point 315 overlooking the 'eastern gate'. One of the company commanders, Major Ferguson Hoey, earned for himself a posthumous VC in this clash.

By the 19th, though the garrison had been strengthened by the 4/8th Gurkhas and the 2nd King's Own Scottish Borderers, general conditions in the Box were deteriorating. The hospital was a shambles as the wounded piled up. Flies by the million infested the primitive wards where the

two surgeons labored without rest in the most unhygienic surroundings imaginable. Ammunition proved a constant source of anxiety. Dumps were repeatedly hit. In trying to put out a fire threatening to destroy the entire stocks, 'King' Cole was badly wounded. He refused to leave his post till the siege ended.

On 21 February, however, Point 1070 fell at last to the 2/1st Punjabis, led by Major Sarbjit Singh, holder of the DSO and Bar. This successful assault opened the way to the Box, and 123rd Brigade moved steadily down the Pass, mopping up isolated posts. At last forced to admit failure, Hanaya was obliged to cancel *Ha-Go* while 7th Division's brigades, breaking out of their individual boxes, fanned out into the jungle in an attempt to cut off Sakurai's withdrawal.

But the ordeal of the Admin Box was not over. Night



Model 92 (1932)
70mm Howitzer (Japanese)

attacks redoubled in their ferocity. On the night of 21/22 February the Japanese broke through to within 20 yards of 9th Brigade HQ. The morning revealed 30 enemy dead ringing the officers' mess. That same morning, a suicidal charge came near to swamping Cole's HQ. But for the murderous volume of fire the Box could then command, it might well have succeeded.

At dawn on 24 February Maj.-Gen. Briggs, who had spent the night at 123rd Brigade HQ, climbed into a Lee-Grant. The last Japanese had been driven from the immediate neighbourhood of the Pass, and the tank 'grumbling out of the eastern entry', crossed the shell cratered ground until it came to a shattered tree marking Messervy's HQ. Clambering from the turret, Briggs held out a bottle of whisky. 'Messervy grinned and took it, and the two shook hands, and the siege was officially at an end.'

For Hanaya, the failure of *Ha-Go* was a disaster. Out of Sakurai's picked 8,000, less than 3,000, starving, exhausted men fought their way back to the Golden Fortress. He had not only failed to destroy 15th Corps (3,506 casualties), but had not entirely pinned down Fourteenth Army's reserves. When *U-Go* got under way in mid-March, 5th and 7th Divisions were airlifted to the central front where both played a major role in the defeat of Mutaguchi's ultimate offensive.

Compared with the scale of that subsequent battle of Imphal-Kohima, the Box was a minor skirmish. Nevertheless the defeat of *Ha-Go*, like Stalingrad and Alamein, was one of the moral turning points of World War II. For the first time in their history as a modern power, the Japanese had suffered a major defeat on land at British-Indian hands.

Patrick Turnbull

◁◁ Major General Sakurai's 55th Infantry Group advance on Admin Box. The Model 92 70mm howitzer is being carried in sections.

◁▽ This howitzer's 8.3lb shell was no match for the armor of the Lee-Grant tank. Muzzle velocity 650fps; Traverse 45°; Range 3,075 yards.

◁ The rarely worn insignia of Japanese 55th Infantry Division. The top symbol was replaced by the lower one in November 1944.

▽▷ These two pictures amply show the gruelling route through the Arakan taken by the Japanese.





Mary Evans Photograph Library

SEA MINES 1914-45

Patterns of destruction sowed to disrupt enemy shipping, triggered by pressure, sound, contact, magnetism

The explosive mine as a weapon of naval warfare on the high seas—as opposed to merely a harbor defense weapon—was first successfully used by both sides in the Russo-Japanese War (1904-5). In the course of this conflict the Japanese Navy lost two battleships, four cruisers, two destroyers and a torpedo-boat to offensively laid mines. The Russians lost one battleship, one cruiser, two destroyers, a torpedo-boat and a gunboat. On this evidence, all the major naval powers took steps to include mines in their armory.

The British type was known as the 'naval spherical mine' and was activated when its horizontal firing arm was struck by a ship. This released a spring-loaded firing-pin against a percussion detonator. But, sticking to the belief that the mine was the weapon of a weaker naval power, the British did not bring impressive energy or enthusiasm to bear. When Britain went to war in August 1914 she possessed a stock of only 4,000 of these primitive devices. The only means of laying them were seven old light cruisers converted to carry 100 mines each. But the technique of minesweeping had been studied and practised. A number of gunboats had been equipped and a Trawler Reserve trained.

In comparison, the Germans had large stocks of efficient, buoyant contact mines activated by the Herz horn firing gear—a system which was to become almost universally used in time. In this, a number of lead horns protruded from the mine casing inside each of which was a glass tube containing a bichromate solution. As soon as a horn was bent the glass tube broke allowing the liquid to come in contact with a zinc and a carbon plate to produce an electric battery. Current flowed from this to a thin platinum fuse wire in a fulminate of mercury detonator. All major German warships and many of their torpedo boats were fitted to lay mines as were also a number of fast auxiliaries.

It was with one of the latter that the mining campaigns of World War I were begun when the minelayer *Königin Luise* laid a minefield about 40 miles off Lowestoft on the night 4/5 August 1914. She was intercepted and sunk by the light-cruiser *Amphion* which was herself then mined and sunk. Mines laid on the night 21/22 August claimed as victims the gun-boat *Speedy* and several trawlers.

The British mining effort was directed first against the enemy U-boats and, when these began to operate in the approaches to the Straits of Dover in mid-September 1914, mines were laid off Ostend on 2 October. It was declared a dangerous area in accordance with the Hague Convention

on the following day. The first of a number of anti-U-boat fields which were to be established along the east coast of Britain was laid in the next few days off Lowestoft. Meanwhile orders were given for the manufacture of large numbers of mines.

The weapon really gained prominence a few weeks later when, on 27 October, the fine new super-dreadnought battleship *Audacious* was sunk off Tory Island, north-west of Ireland, by a mine laid by the armed merchant-cruiser *Berlin*. Perhaps as a result of this the C-in-C of the British Grand Fleet was won round to the notion of mining the Heligoland Bight. Here, the first field was laid off the Amrun Bank athwart a regular route of the German High Seas Fleet in January 1915 by the mine-laying cruisers. Further afield the Turks scored a spectacular mining success in the operations in the Dardanelles where the British battleships *Irresistible* and *Ocean* and the French *Bouvet* were all sunk in one day—18 March 1915.

In home waters, both sides stepped up their efforts throughout 1915. The British converted several passenger steamers to mine-layers. U-boats were adapted by the Germans for the same purpose in April. The British similarly fitted the submarines *E24* and *E41*. More fields were laid in the Heligoland Bight and in August the German mine-layer *Meteor* penetrated to the Moray Firth. She was challenged by an armed boarding-steamer *Ramsey* which she promptly sank and then laid a field which claimed the destroyer *Lynx* on the next day.

Events continued in this see-saw fashion throughout 1915 and 1916—the German effort being the more effective because of the head start in quality and quantity of mines they enjoyed. Besides the *Lynx*, the British lost two destroyers and two submarines in the North Sea and another destroyer in the Channel during 1915. In 1916, mines claimed the pre-dreadnought *King Edward VII*, and the cruisers *Arethusa* and *Hampshire* in home waters—the last of these causing a great furore because of the drowning of the War Minister, Lord Kitchener, who was travelling in her to Russia. Both sides were forced to devote a massive minesweeping effort just to keep channels open. Most of this work was done by trawlers. The original simple system of towing the sweep wire between two ships was modified so that it was towed by a single ship with a fisherman's 'otter' to carry it out laterally and a 'kite' to take the wire down to the correct depth. This system—standardized as the 'Oropesa' sweep—had the advantage of giving protection to all ships of a sweeping force except the leader. An important defensive development of 1916 was the 'paravane' with which a ship could gain a good measure of self-protection by means of bow sweep wires. During 1917 all major war vessels were provided with this equipment.

Wide-spread, open-sea mine warfare began off Port Arthur in 1904. On 15 May that year the Russian minelayer Amur sowed mines off the Tiger Peninsula and sank Japan's battleship Hatsuse, 15,000 tons, with 495 crew.

1



Up to late 1916 the British minelaying effort had not been very intensive—though about 6,000 mines had been laid in the Heligoland Bight. But by the beginning of 1917 a new and much more efficient mine—the Mk H11 with Herz horns firing a charge of 320lb of TNT—had been developed. The decision was taken to bring stocks up to 100,000. Many light-cruisers, destroyers and coastal motor-boats were adapted for laying them. From these developments emerged the notion of laying mine 'barriers' to seal off certain sea areas.

The first proposal made by Admiral Sir David Beatty in January 1917 was that the Heligoland Bight should be treated in this way, but the 60,000 mines required were not available at that time. Extra fields were laid, however. By the end of 1917 these had inflicted heavy casualties and German minesweeping could only attempt to keep certain main routes open. The remainder of the Bight was left unswept.

Following the Battle of Jutland on 31 May 1916, the main German naval effort was switched to prosecuting an all-out campaign by U-boats against merchant shipping. This proved so successful in the absence of any British convoy system that it was decided to try to seal off the whole North Sea. At first, this was to be done by a barrage across the English Channel. Then, with the help of the huge access to manufacturing and laying capacity following the entry of the United States into the war on the Allied side in April 1917, a Northern Barrage between the Orkneys and the coast of Norway was to do the job.

Efforts to obstruct the U-boats based on Belgian ports had begun early in 1916 when a 'zareba' of mined nets and double lines of deep contact mines had been laid between Ostend and the Scheldt. Initial success had led to over-confidence in the effectiveness of this system. Further lines of mined nets were laid—notably one between the Goodwin Sands and the Snouw Bank, off Dunkirk, in January 1917. This was renewed in July of that year. Meanwhile, however, the Vice-Admiral, Dover, had been advocating the use of the new mines to spread a deep barrier between Cap Gris Nez and the Varne shoal in mid-Channel with mines moored at various depths between 40 and 100ft. This was begun in November 1917.

2



3



1 The minelayer *Königin Luise*. She started the mining cat-and-mouse game of World War I when she laid a field 40 miles off Lowestoft, Suffolk, on the night of 4/5 August 1914.

2 Minelaying activity in World War II was intense. Here, one of Germany's minelayer force is being prepared for operations in the Atlantic and the North Sea

3 World War II minelayer *Manxman* being loaded. With a speed of 36 knots she could escape almost any German pursuer.

4 British minelayer. The mines ran along rails to the dropping point.



It was then further decided to extend the barrier from the Varne to Folkestone. The laying operations, in which 10,000 mines were used, took until August 1918 to complete.

This barrier proved a success, primarily because it was possible to patrol and illuminate the sea surface over it, thus forcing any transitting submarine to do so at depth. At least 13 and probably 15 U-boats were destroyed in the deep fields, and its deterrent effect played an important part in defeating the U-boat campaign. The Northern Barrage was less successful. There the plan eventually agreed between the British and Americans called for the establishment of a barrier of deep and shallow mines 240 miles long, leaving a gap of ten miles between it and the Orkneys in which only deep mines were to be laid.

This vast undertaking, began on 2 March 1918, was more or less successfully completed on 26 October 1918. It called for highly efficient organization and great technical and nautical expertise. To reduce the immense number of mines which would otherwise have been needed, American technology devised the 'antenna' mine. The original model had a vertical danger space of 140ft, thereby doing the work of four contact mines. To handle the American contribution, mine depots were established at Invergordon and Inverness; two cruisers and eight merchant ships were converted and laid 56,033 antenna mines; four British minelayers laid 15,093. The American Secretary of the Navy, Mr. Josephus Daniels, was to call this an enterprise which 'shut-up the hornets in their nests'.

Unfortunately for the planners of 1939, it was a wild exaggeration of the results achieved by the Northern Barrage. Patrols for such a huge area could not be spared. The mines were less efficient than expected and were prone to explode prematurely. The antenna mine, in particular, had to be laid without the lower antenna. This reduced its danger space; it also proved to be less sensitive than expected. The Barrage, in fact, little hindered the free passage of U-boats of which only five were destroyed by it for certain and one more probably.

By the end of World War I the British had laid over 128,000 mines which destroyed about 150 enemy war vessels and auxiliaries, including 35 U-boats. In reply the Germans, with 43,000 mines, sank 40 British warships and

225 auxiliaries. About a million tons of Allied merchant shipping was lost through the same cause

But sinkings are by no means the only or even the main criteria for judging the effectiveness of a mining campaign. The minesweeping effort forced upon the enemy, the disruption of his supply and transport organization and the interference with the free use of his own home waters, can be even more important. This was to be proved true in World War II.

When that war started, Britain was in a much more favorable position in regard to mine warfare than in 1914. Besides the obsolete but still effective moored contact H11 mine, the improved Mk XIV with a detachable charge case containing either 500 or 320lb of HE and with 14 Herz horns, had been developed. By developing a finer, lighter mooring wire, and increasing the buoyancy of the mine and the size of the sinker, it became possible to lay them in much deeper water. In the Mk XV which followed, switch horns replaced the Herz. For laying these types the minelayer cruiser *Adventure* was laid down in 1922, carrying 280 of them; in 1938 the first two of a class of very fast (39-knot) minelayers, the *Abdiel* and *Latona* were authorized. Each was to carry 160 mines. A Mk XVI mine adapted for laying by the specially designed minelaying submarines of the *Porpoise*-class was also in production. The first of these submarines was laid down in 1930.

Before the end of World War I Britain developed non-contact mines activated magnetically and acoustically. A small field of magnetic ground-mines was laid off Ostend and Zeebrugge in August and September 1918. Research and development on a small scale continued in the inter-war years and in September 1939 a moored magnetic mine (M Mk 1) was in stock while an aircraft-laid ground magnetic mine (A Mk 1) was poised to go into bulk production. Counter measures against an enemy's use of non-contact mines had also been studied—especially in the fields of de-magnetization of ships and of sweeping techniques.

It is a false though widely accepted tale that the Germans invented the magnetic mine and caught the British unawares when they began to use it in November 1939. But no effective counter measures against them could be devised

until it was discovered which component of the magnetic field (longitudinal, vertical or athwartships) was being used, and what sort of change in the chosen field. If the Germans had stuck to their plan of laying only by submarines, it might have been a long time before this information was obtained. But Hermann Goering's prestige-hungry *Luftwaffe* insisted upon joining in. A mine was dropped on a mudflat in the Thames Estuary which was recovered and heroically dissected by Lieutenant Commander J. G. D. Ouvry. It was discovered that the actuating mechanism, a simple dip needle, exploited the *increase* in the earth's magnetic field caused by the magnetism of a passing ship. It was now possible to apply suitable demagnetization to ships, permanently by 'de-gaussing' or temporarily by methods known as 'flashing' or 'wiping'.

The German system as initially devised had two serious disadvantages. First, the setting of the actuating mechanism was only appropriate for a particular area and had to be applied during manufacture. Thereafter, if an alteration of location was needed, the mine had to be sent back to the factory. Secondly, the dip-needle system was so sensitive to shock that an air-laid mine required a large parachute and a slow rate of descent. This made accurate laying difficult and helped mine-watchers to spot its final position.

Solution to the magnetic mine

But even in its early primitive form, the German magnetic mine was difficult to sweep and 27 merchant ships, totalling 120,958 tons and the destroyer *Blanche* were sunk during November. Many more were damaged including the cruiser *Belfast* and the *Adventure*, and on 4 December, the Home Fleet flagship *Nelson*. 'Mine-destroyer' ships, fairly large vessels with a massive electromagnet in the bow, were for a time successfully used to detonate the mines but at the price of injury to themselves and their crews. Improved counter-measures meant that this hazardous method was soon abandoned. Magnets attached to an ordinary sweepwire or mounted on a towed raft also had a limited success. The solution finally reached was the 'L' sweep. Two buoyant cables, one of 175 and the other of 750 yards with electrodes of opposed polarities at the end of each, generated an intermittent magnetic field between them by means of pulsed electric current.

Meanwhile, much of the British minelaying effort was being concentrated on defensive minefields, primarily against U-boats. A Dover Barrage was begun on 11 September 1939 by the laying of a field of deep and shallow H11 mines across the Straits. It was followed by a barrier of deep H11 mines between Folkestone and Gris Nez. This barrage was an immediate success. It destroyed three U-boats in October, after which the Germans gave up routing them through the Channel. An East Coast Barrage of moored mines from Ratray Head to the Thames and another huge series of fields between Scotland and the Faeroes and between the Faeroes and Iceland were then begun. The laying of the latter involved operations continuing until January 1943. Yet another barrage was laid in August 1940 across the St. George's Channel.

There is little doubt that a failure to analyze the effectiveness of the Northern Barrage in World War I led to the expenditure of this vast effort or that the results were meagre even after the minefields were modified later in the war by the laying of deep anti-U-boat mines. Certainly the U-boats regarded the 'Rosegarden' as they called the

Northern Barrage, with contempt, and few were inconvenienced by it—though one U-boat was at last sunk south of Iceland in 1944. Not until deep anti-U-boat fields were laid athwart convoy routes thereby making them offensive, *patrolled* fields (patrolled, that is, by the convoy escorts at the crucial times) did the mine fields investment in home waters earn a dividend.

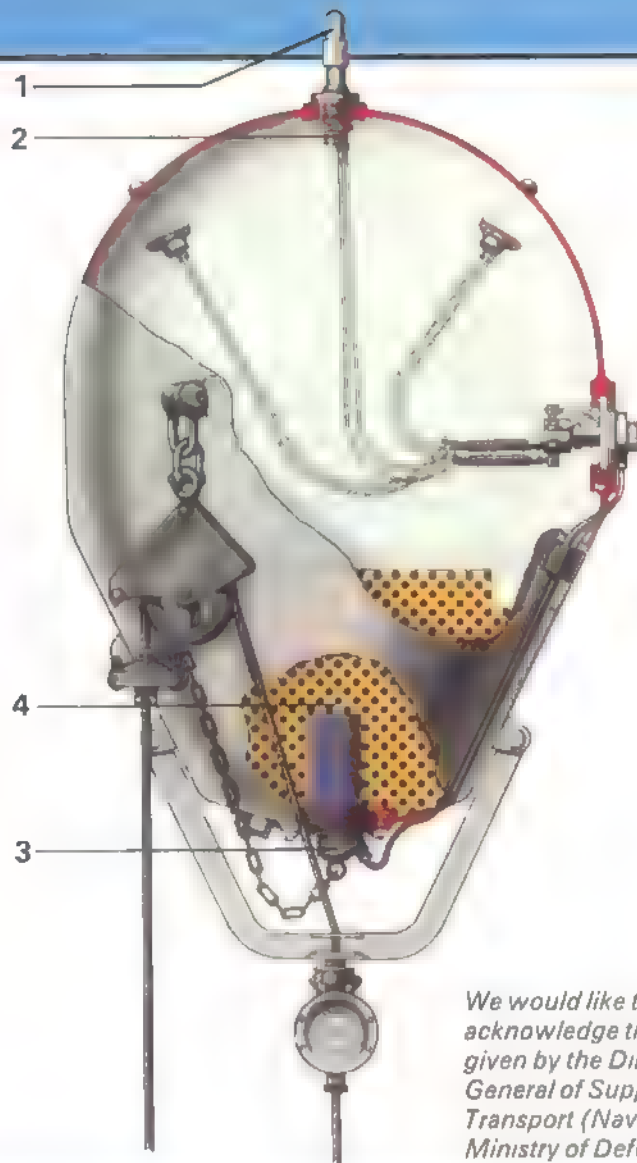
A very different picture emerges from the offensive campaign in enemy waters. The main feature here, compared with World War I, of course, was the ability to lay airborne ground mines deep into enemy waters. Operations began in April 1940 when Handley Page Hampden aircraft of RAF Bomber Command laid mines in the Great and Little Belt and the Sound between Denmark and Sweden. Shorter-range Bristol Beauforts of RAF Coastal Command mined the Jade Estuary. By the end of June 1940 the Germans had been given a minesweeping problem from the Scheldt to Lubeck and after the fall of France coastal waters from Dunkirk to the Gironde were added to it.

The campaign now developed into a fascinating contest between Allied technicians and scientists to produce mines more and more difficult and costly in manpower and ships to sweep; and an ever-growing German minesweeping organization striving to keep open the ports and sea routes along the immensely long coastline in their occupation. British technicians evolved a ground-mine which could be released from 15,000ft so making the laying operation less hazardous. They introduced an endless succession of variations in the actuating mechanisms with arming delays and other ingenuities. Acoustically fired ground and moored mines were developed, followed by mines with combined magnetic and acoustic circuits. The Germans were not idle at this time, but it is fair to say that they lagged behind their opponents and did not succeed in presenting them with nearly as acute a problem. An indication of this is that the Germans, unlike the British, were never able to dispense with the 'mine-destroyer' ship (*Sperrbrecher*) of which they sustained 31 sunk and 77 damaged.

The RAF's mine-laying role

Some idea of the immensity of the task given to the Germans may be gauged from the fact that the whole of the Baltic now became the target for RAF minelaying aircraft, hampering the trials and exercises of German warships and U-boats. The former were often mined during trials after repairs and sent back into dock; the latter were steadily driven up the Baltic coastline as far as Gdynia. Even there they were harried by repeated minelays. One vital result was that the Type XXI U-boat which, with its high submerged speed, might have swung the advantage in the war at sea back to the Germans, and of which several hundred were being built, never became operational before the end of the war.

Thus the campaign achieved important results without necessarily sinking any enemy warships. The mining of the *Scharnhorst* and *Gneisenau* after their spectacular dash through the Channel to get home from Brest was an immediately visible dividend. At least equally damaging to the Germans was the mining of the Kiel Canal in April 1944 which resulted in a virtual loss of over a million tons of cargo though not one ship was sunk. A minelay which not only sank many ships (200 river steamers, tugs and barges) but gravely disrupted the German transport



◁ A Type 1 German Naval Mine of the simple contact design. Each of these mines was sunk to a pre-set depth. They incorporated the Herz horn method of firing. This was invented in 1868 by Dr. Herz of the German Mine Defence Committee. Inside each lead horn (1) was a glass tube containing bichromate solution. When a ship contacted one of the horns it was bent, the glass tube shattered and the solution came into contact with a zinc/carbon plate to produce an electric battery (2). Current passed into a thin platinum fuze wire in a fulminate of mercury detonator (3)—firing the charge (4). This system was eventually adopted for all contact mines.

◁ ▽ A German minesweeping patrol of World War I. The number of ships and men tied up in mine-sweeping duties was as damaging for both sides of the mine war at sea as the actual tonnage in ships destroyed.

▽ World War II. A German technician on minesweeping duty. With care, he is fuzing a mine, often a dangerous task in high seas. Working quietly and without fuss men like this acquitted themselves more heroically than most front-line soldiers.

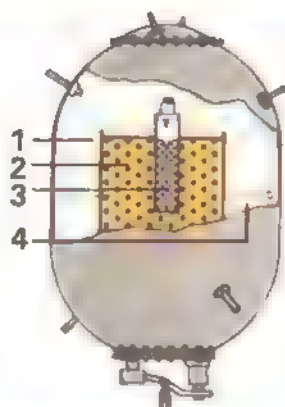
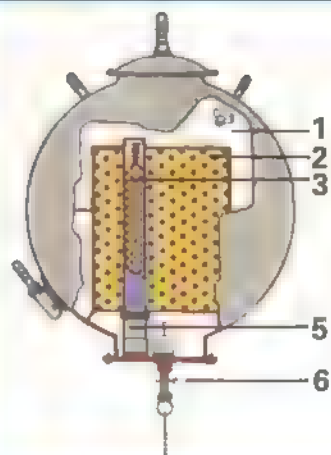
We would like to acknowledge the assistance given by the Director General of Supplies and Transport (Naval) and the Ministry of Defence



Foto Druppel



Foto Druppel

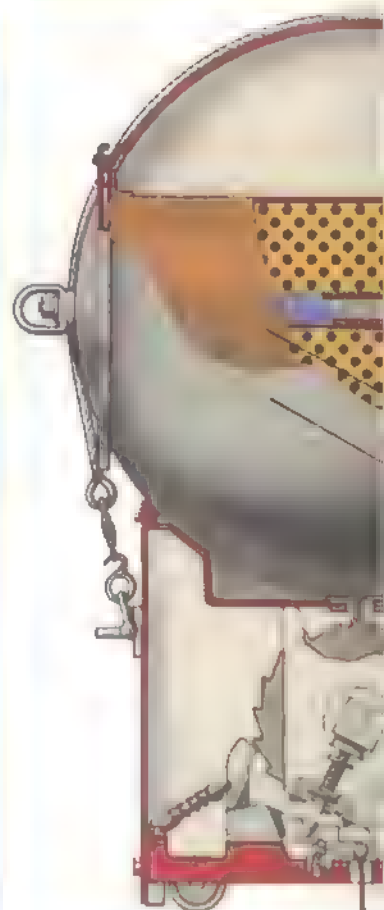
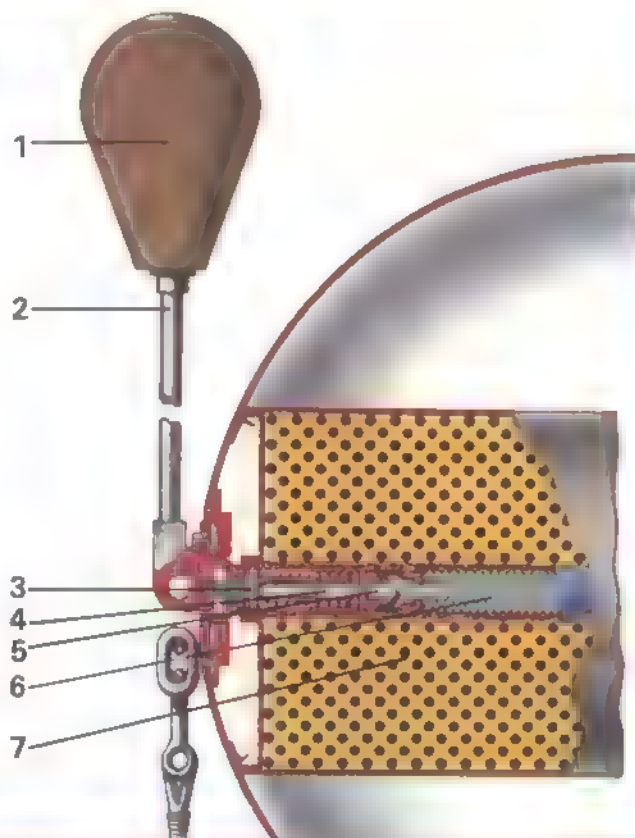


◁◁ The British Mk XIV—developed in the inter-war years—was equipped with 14 Herz horns. 1 Buoyancy chamber 2 Charge 3 Primer 4 Detonator 5 Safety pin. A hard knock often failed to break the glass tube inside each of the horns.

◁ British H11 Mine. 1 Buoyancy chamber 2 Charge (320lb explosive) 3 Primer 4 Ring main. Four Herz horns were fitted at the top and two at the bottom.

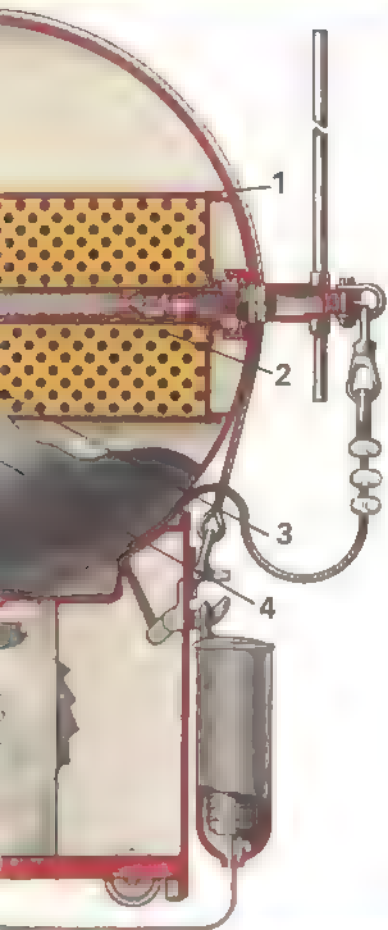
BRITISH VICKERS Mk V MINE (THE DETONATOR)

▷ This was a kind of contact mine, but did not rely on Herz horns to collide with enemy shipping. Instead, a cork buoy (1) was used. When a vessel knocked against this a firing lever (2) was depressed. The action of the firing lever operated a shearing pin (3) which broke through the striker stem (4). The striker head (5) was thus rammed hard into the primer (6). The friction thereby created ignited a spark which exploded the charge (7). This mine was used in the early part of World War I. It was not all that reliable and was soon replaced by Herz horn mines. Even if a ship did strike the small cork buoy, the friction-operated detonator often failed to function.



HMS Apollo (Minelayer)





BRITISH ELIA MINE

This was one of the first mines to see action in World War I. Originally an Italian-produced mine, the British naval authorities first showed an interest and examined the Elia Mine in 1901. The British improved on the Italian design and the Elia Mine came to replace the more primitive spherical 'service' mine previously in use. The diagram shows the mine on its minelaying carriage. When a vessel collided with the firing lever (1) it was depressed. This action acted as a trigger—firing the pistol (2) which sent a projectile into the primer (3). This action detonated the charge (4). Its 220lbs of TNT produced a huge explosion.



Imperial War Museum

◀ A German magnetic mine of early World War II. As can be seen by the rule alongside it was a pretty hefty weapon. Magnetic mines are detonated by their reaction to the magnetic field of ships. Degausers were used to combat them.



The Allied invasion of Normandy (Operation Overlord) on 6 June 1944 was preceded by an intensive minelaying operation. HMS Apollo played a central role. Displacement 2,650 tons; Armament 4x4in, 4x40mm Bofors, 12x20mm (all AA), 156 mines; Complement 246; Speed 40 knots on 2-shaft Turbines of 72,000hp.

system, particularly of oil, was that carried out by the Mediterranean Allied Air Forces between May and October 1944 in the Danube.

A good idea of the effect of the technological contest in mine warfare can be gained from a study of the difficulties suffered by the Germans in getting their U-boats in and out of their Biscay bases. They were forced to escort each one with a minesweeper or *Sperbrecher* steaming ahead of it. This was then countered by a mine which required a strong magnetic field followed at the correct interval by a weaker one to fire it. Thus it ignored the minesweeper and exploded under the U-boat. If the first mechanism was triggered but not the second (by, for example, a minesweeper alone or at too great a distance ahead), the mechanism was automatically reset to await the arrival of the correct combination. When the Germans countered by using two minesweepers, the mechanism was altered to take two coarse magnetic impulses followed by a weaker one. Only when three minesweepers were then employed—with its consequent large increase in the minesweeping effort involved—did the technologists come up with other devices to maintain the harassment.

Operation 'Sterilize'

Operation Overlord—the Allied invasion of Normandy—involved a huge preliminary minelaying operation by aircraft of RAF Bomber Command, the fast minelayer *Apollo* and a large number of MTBs and MLs. Between 17 April 1944 and D-day (6 June), 4,000 mines were laid by aircraft and 3,000 by ships. New types of mine made the German minesweeping problem more difficult than ever and no fewer than 100 of their ships of various types were sunk or damaged by them. So that they should not affect the freedom of movement of Allied forces on and after D-day, steps were taken to make them safe at a chosen moment by the incorporation of clock-operated 'sterilizers'.

The Normandy landings also saw the introduction by the Germans in the shallow waters around the 'Mulberry' artificial harbors of the virtually 'unsweepable' 'Oyster' or pressure mine. This was fired by the reduction in hydrostatic pressure at the sea-bed caused by the passage overhead of a ship. The British had, long before, devised a mine of this sort, but had deliberately avoided introducing a weapon for which there was no antidote, for fear of being 'hoist with their own petard'. The Germans had acted in like manner until their desperate situation brought a direct order from Adolf Hitler to use it. The only possible counter to it was to reduce to a crawl the speed of ships in the mined area—a serious obstacle to naval operations.

Even from this brief summary it can be seen that mine-laying exercised a very considerable influence upon the conduct of naval operations in both World Wars. This was especially so in the Second, in which more than 1,000 British and a similar number of Axis warships and merchant ships were sunk. (Japanese casualties are not included.) At least as important, however, were the indirect results—the disruption of vital sea traffic, the hold-up of transport of essential materials and fuel and the expenditure of much needed manpower and material in minesweeping. That the British effort was more successful than that of the Germans may be judged by the fact that, on their own admission, the latter's defenses were eventually swamped and in the closing months of the war could no longer cope with the situation.

Donald Macintyre



W.O. Donald Gray

'BALE OUT!'

**His starboard wing ablaze,
Donald Gray ordered 'Bale out!'**

Sergeant Pilot Donald George Gray RAF, from Ilford, Essex, was bored with his job as an RAF Training Command staff pilot. Day after day he flew student wireless operators and air gunners round and round in an area off the west coast of Scotland and the Irish Sea while they practised radio procedure and gunnery. Later, he was appointed a classroom instructor in navigation. But Sgt. Gray wanted action. He had not joined the RAF in 1940 to act as a 'taxi' pilot or classroom teacher. His flying training had begun on the wonderful Tiger Moth, then on twin-engined Airspeed Oxfords and Avro Ansons. Unfortunately Gray's natural aptitude as a navigator was the reason for his being kept off the operational flying he so badly wanted to take part in. 'Too good a pilot for operations' was the verdict of his superiors. But Sgt. Gray had other ideas. There was

one way to get on Ops.—make yourself enough of a nuisance and a posting usually followed. So off Gray went one day to indulge in some highly improper and unauthorized low flying. For this he received an official reprimand and that sought-for posting.

The posting was to a Conversion Unit where experience of larger aircraft was gained. This time he flew Vickers Wellingtons, then the four-engined 'heavies', starting with the Short Stirling. Being such an accomplished pilot, Gray found no problems with these large bombers, the Stirling giving its usual excessive swing on take-off, but nothing more. The Lancaster he found a delight to fly, quick and responsive on controls, its four Merlins giving a much different sound from the Stirling's radial Hercules, but just as reliable.



In the spring of 1944, 22-year-old Sgt. Gray's posting to an operational unit came at last. He was given a 'headless crew'—one that had no pilot—and sent to No. 50 Squadron, based at Skellingthorpe, Lincolnshire, England, and equipped with Mk. 1 Lancasters.

After a couple of days Gray and his crew were getting to know the station and making friends. At the time he had been promoted to Warrant Officer, but the notification did not come through until later. From here on, however, he is given his proper rank.

The atmosphere on the station was far from happy. Following normal practice at Skellingthorpe, Warrant Officer Gray's crew were not allowed to leave camp for fourteen days after arrival in case the Wing Commander wanted to send them off on a cross-country flying exercise. Rigorous conversion courses to Lancasters, followed by action over Germany, meant that Gray and his crew had not any leave for about three months. On Thursday evening, 29 March, some members of the crew decided to descend on the pubs of Lincoln. Later that night, the Wing Commander wanted them for flying duties. Gray explained that some of them were out of camp and he was angrily ordered to visit every watering-hole in Lincoln and bring his wayward comrades up before his Commanding Officer.

Came the dawn of 30 March and W.O. Gray escorted the downcast miscreants of his crew to the station HQ Orderly Room to see the CO—only to be brusquely informed that the great man was planning a mission for the coming night and was far too busy to see them.

They were naturally relieved. But had they known what was in store for them, they would have willingly chosen the ogre in the office. The Wing Commander was planning Skellingthorpe's contribution to the Nuremberg Raid (30/31 March 1944).

W.O. Gray recalls a cheerful WAAF sergeant at Skellingthorpe who, it was seriously alleged, had a drastically adverse effect on the luck of her boyfriends. It was claimed that every member of the RAF she befriended failed to return from a subsequent mission. A number of RAF bomber stations also claimed a similar glamorous Gremlin. On the evening of 30 March, Gray was sitting in the Sergeant's Mess having tea when the young WAAF began chatting to him. From that moment on, knowing of the ominous tales of the girl's effect, he regarded the coming mission with gloomy forboding.

A crowd of RAF ground-staff stood near the end of the runway as W.O. Gray's Lancaster R5546 'T-for-Tare' lifted off. These people always stood there to wave the planes and their crews off and wish them 'Good Luck'. On this occasion the friendly WAAF was conspicuous in the front of the crowd.

By this stage of World War II, Gray's aircraft had been through more than 40 operations. Although well seasoned she was still reliable. Most of the flight from England to enemy territory was handled by 'George', the invaluable automatic pilot. But soon after take-off Sergeant Bert Wright, the wireless operator, found that his 'Fishpond' set was not working properly. This primitive installation warned



of other aircraft in the vicinity but could not distinguish friend from foe. Not long after this discovery it was found that the intercom linking the cockpit with the rear gun-turret was faulty. There was something wrong with the helmet of the rear gunner, Sergeant Douglas Maugham, which also served as an oxygen mask. It seemed that the baleful influence of the 'friendly' WAAF was again beginning to impose itself

The W/Op took a spare helmet to the rear gunner. They found it impossible to fix it, and Bert Wright reported that the gunner was losing consciousness in the rarified air.

By this time, things were getting dangerous. Gray and his crew were at 22,000ft skirting the edge of the heavy flak defenses south of Aachen. Their lookout—the rear gunner—was out of action. Bert Wright had to return to his radio to be on the alert for important messages from base. The flight engineer, Sergeant Joseph Grant, took a portable oxygen bottle and made his way to the rear to give assistance. Within a couple of minutes the W/Op reported that the flight engineer, too, was unconscious in the fuselage.

Balls of flame that were stricken bombers

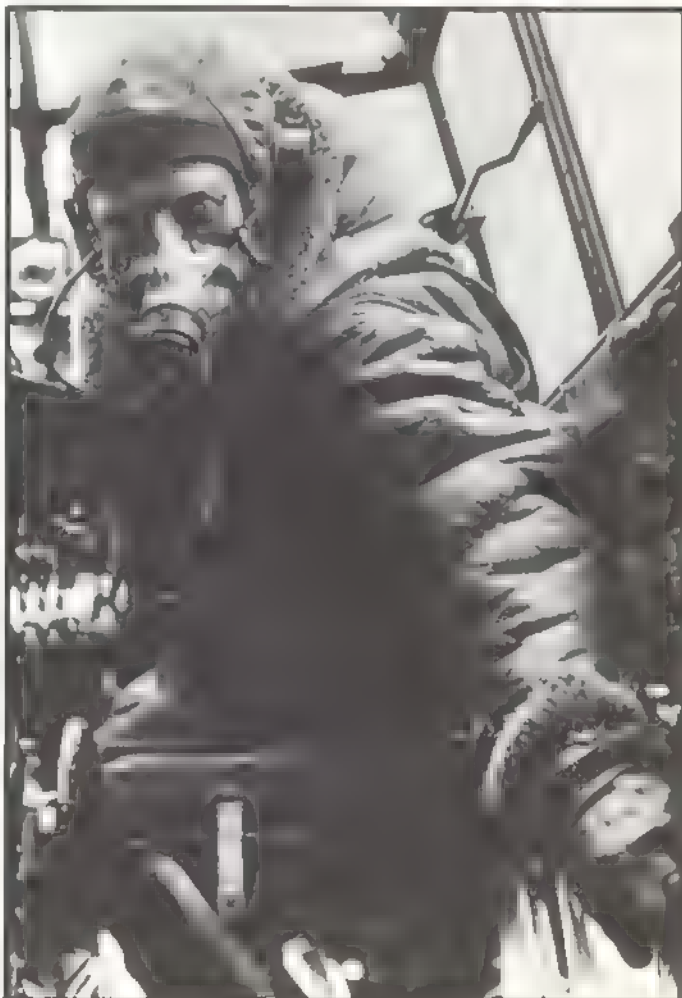
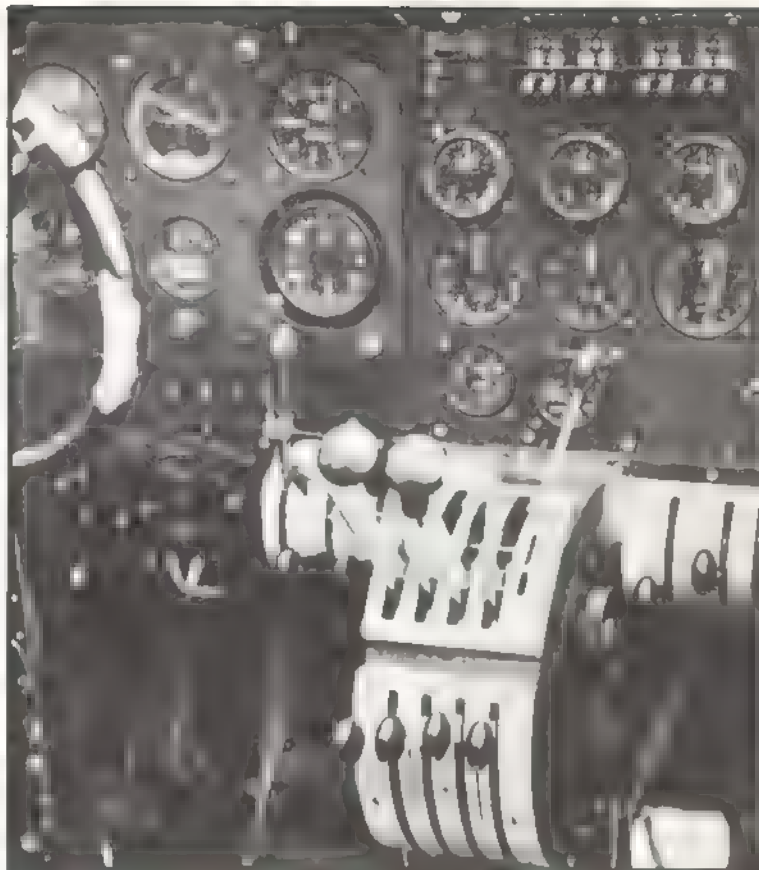
'T-for-Tare' was now on course for Fulda, about 90 miles NNW of Nuremberg. Gray knew they were heading for trouble. Ahead were the enemy fighter flares and the massive balls of flame that were stricken bombers. Suddenly the mid-upper gunner, Sergeant Frank Patey, shouted that they were being attacked and began firing. Gray put the Lancaster into evasive action—'Corkscrew Left'—until the mid-upper AG reported the attack over, then the Lanc. was straightened up and got back on its course of about 090 degrees.

Now there was the problem of what to do about the two unconscious crew members. Gray had no choice but to reduce altitude. He put down 5° of flap and began to lose height as fast as he could without affecting ground speed. A change in ground speed would affect his laid-down ETA on target, and upset the calculations of Flt. Sgt. Alan Campbell, the navigator.

Then there was an explosion.

'Christ!' screamed the bomb-aimer, Flt. Sgt. George Wallis—'T for Tare' was hit. The starboard outer engine was ablaze. Had the flight engineer been in his place he would immediately have taken emergency action—petrol switched off, pitch to coarse, props feathered—and operated the grainer-switches which electrically set off fire extinguishers in the engine nacelles. As it was, Gray had to undo his seat harness to reach the switches at the other side of the cockpit. By the time he managed to operate them it was too late. The starboard wing was burning from end to end and the aircraft was in a near-vertical dive and failing to respond. The control was jammed firmly against the instrument panel.

Over the intercom, Gray called: 'I can't put the fire out, and the aircraft is out of control'. There was no alternative but to give the 'Bale out' order. Gray pressed the emergency light button. The conscious crew members had just acknowledged when there was another bang and Gray felt a vicious pain sear across his left knee. Ignoring it, he took off his gloves and helmet and clipped the parachute pack onto his harness. Opening the bomb-doors to dump the 4,000lb 'cookie' and the incendiaries he was faced by dazzling light and searing heat. Then he decided not to jettison the bomb, which would effectively destroy the





1 A Lancaster cockpit. To the right of the wheel is the throttle quadrant, and above it the boost and rev counters for the four engines.

2 The Flight Engineer sitting on his fold-up seat. Below this is the step to the bomb-aimer's position down which the navigator fell just as the perspex nose of the Lancaster came away. Outlined (1) the four graviner switches which the Flight Engineer would have operated to extinguish the flames in the starboard engines. But he was still back towards the tail, and Gray had to release his seat harness in order to reach them. It was at this moment that he probably released the turnbuckle of his parachute harness.

3 Lancasters of 50 Sqn, code letters VN, being bombed-up at Skellingthorpe, Lincs.



aircraft when it hit the ground and leave little for German Intelligence to work on. But now a mysterious object was busily slapping him about the face. It was the parachute pack. At this point W.O. Gray was convinced he had 'had it'. Realizing he had nothing to lose, he pulled the rip-cord of his parachute.

Suddenly, silence and blackness surrounded him. No heat, no flame—no aircraft. He felt nothing beyond a slight but continuous tugging at his ankles. Wondering how his arms came to be raised above his head, he lowered them. It was as if some alien force had taken charge of his body, for his arms immediately returned to the raised position. Beyond his feet was the white parachute canopy, while lights flashed in an indigo sky. And W.O. Gray realized that he was no longer a part of his blazing Lancaster. A wave of relief swept through him.

His relief turned to panic as he realized that he was hanging upside-down—a fall to certain death prevented only by the parachute harness tangled round his ankles! Gray is still not certain how his harness came to be in this position. He assumes that when he undid his seat straps to get to the graviner switches he accidentally operated the release turnbuckle on the parachute harness.

Gray locked his ankles tightly together and went through his 'limited repertoire of prayers'.

His head hit the ground

There was a gentle brushing against his face. Then his head hit the ground with a violent bang. The next thing he knew, he was flat on his back, totally winded and feeling as if every bone in his body was broken. But he was still alive.

Half-stunned and shaking, Gray stumbled to his feet.

As he moved his legs to see if any bones were broken his parachute harness dropped off. He seemed to be in one piece and could dimly make out that he was standing at the edge of a forest. He decided the best thing to do was to make himself scarce as his unusual arrival could easily have been seen.

Gray rolled up his parachute and thrust it under a bush. The white scarf around his neck was disposed of in case it gave him away in the dark. To make life difficult for any potential captors, he removed his pilot's brevet (wings) and threw it away. But Gray kept his Irvine jacket. It was a chilly night.

Making slow progress he stumbled off. His legs were badly bruised and cut about and every time he breathed there was a stabbing pain in his chest. His eye-balls felt as if they were about to burst from his head.

Silence pervaded the night. W.O. Gray listened, but could hear nothing that would lead him to any of his crew who may be alive nearby. The moon was setting in the west and Gray headed in that direction. Within a matter of seconds he stepped on to the concrete ribbon of an autobahn—a German motorway—gleaming white in the moonlight. Had he landed there Gray would have been killed outright by a broken neck.

Crossing the exposed autobahn as quickly as he could, he found himself on a footpath with park benches at intervals. This was evidently a local beauty spot. Soon he came to a road. A fast-moving stream ran beside it. There were houses nearby.

W.O. Gray was feeling pretty weary by now, so he went back up the lane and lay down under a bush to rest. But the cold of the night combined with the effects of shock

began to get the better of him. He began to shiver violently. Sleeping in the open would be impossible.

Suddenly, he heard the faint rumble of a train. Still in a confused state, Gray made off in the direction of the noise with the rather impractical plan of hitching a lift. On his way, the houses grew in number, and it soon became clear that he was entering a small town. A level crossing appeared in front of him.

Gray started to walk towards it. Two torches pricked the darkness near the crossing. Too tired to turn back, Gray decided to walk past on the other side of the road as inconspicuously as possible and chance that he would not be noticed.

It was a vain hope.

Four elderly civilians armed with rifles stepped out of the gloom. They all wore armbands. They were obviously the German equivalent of the British 'Home Guard'. Even though W.O. Gray was unarmed and too weak to resist, he could not help noticing that all four were terrified of him.

None of Gray's captors spoke English, but one of them could speak French. That was no help at all—Gray's schoolboy French was too rusty.

'*Americanisch?*' inquired one of his ageing captors.

'*Nein, Engländer!*' Gray replied in a tone of offended patriotism.

'*Ach! Heil Churchill?*'

'*Ja!*'

He was then escorted a little way down the road, through a door, up a flight of stairs and into a neat, well-furnished office. Hitler's portrait hung on a wall. Then a policeman stalked into the room and, for some mysterious reason, began to scream and rave at Gray's bewildered, civilian captors.

His watch had stopped at 0025

But the policeman's attitude became more civil when he turned and indicated that Gray was to turn his pockets out and produce his identity discs. It was then that the Warrant Officer noticed that his watch read 0025. The impact of his landing must have stopped it.

After being given a glass of water—for which he remembered the German name '*wasser*' from a Humphrey Bogart film—and allowed to smoke one of his cigarettes, his left leg was bandaged by the policeman. It was pretty badly cut and had a nasty gash at the side of the knee.

Gray was now led downstairs, across a courtyard and into a cell. The door slammed behind him and he found himself alone in a sparsely furnished cubicle. In the corner was a roughly fashioned wooden bed with a coarse blanket thrown across it. Now, Gray felt the oppression of captivity for the first time. As he lay down, fatigue overwhelmed him. In seconds, he was asleep.

He awoke to a brilliantly sunny morning. The policeman of the night before came for him. An open lorry was parked in the yard. A knot of women and children stood staring.

Gray clambered into the back of the truck and found himself sitting next to a man wearing an RAF tunic. He was the very picture of misery and when Gray attempted to open a conversation, he was rewarded with a grunt. And Gray did not feel in the best of health either. His eyes were not swollen any more, but his legs were painfully stiff and the rest of his body felt 'as if I had been kicked by a mule' (An investigation after the war by author Martin Middle-

brook revealed that the man was Warrant Officer Hall, RNZAF, a bomb aimer. He had been badly beaten up by a German policeman.)

A policeman sat in the back of the lorry with Gray and his morose companion while a civilian did the driving. They travelled along the eastern bank of what Gray guessed was the Rhine, crossed the famous bridge at Remagen and came to a halt outside the town's police station. (Later, Gray guessed that he had been picked up in Königswinter, just SE of Bonn, from where he was driven to Remagen.)

Immediately inside the police station, Gray was accosted by an ageing policeman, excitedly waving a newspaper. The paper told of shattering Allied losses on the Nuremberg raid. Gray's reaction was to dismiss the report as 'Goebbels' propaganda', although the RAF did in fact suffer very heavily indeed on the night of 30 March.

... a hole filled with blood

But the ancient *politzei* kept on jabbering and pointing to Gray's eyes. Gray walked over to a mirror in the corner. No wonder his original captors were scared stiff! The make-up man for a horror movie could never have done a better job. In the middle of each huge black eye was a hole filled with blood. The force of Gray's landing must have burst all the blood vessels in the eye-balls. The explanation is simple, but the effect was frighteningly macabre—yet he felt no discomfort.

All the staff at the police station stared fearfully at Gray as he and W.O. Hall were taken to the cell block and locked up. Hall was still as silent as ever and was in obvious distress. Gray rolled up his Irvine jacket to serve as a pillow and laid Hall onto it. Whimpers and low moans were coming from one of the neighboring cells. The noise was beginning to get on Gray's nerves when the cell door opened and four scruffy and dispirited RAF officers and NCOs entered. They were accompanied by a pale little fellow with only one leg and dressed in a combination of civilian clothing and American uniform.

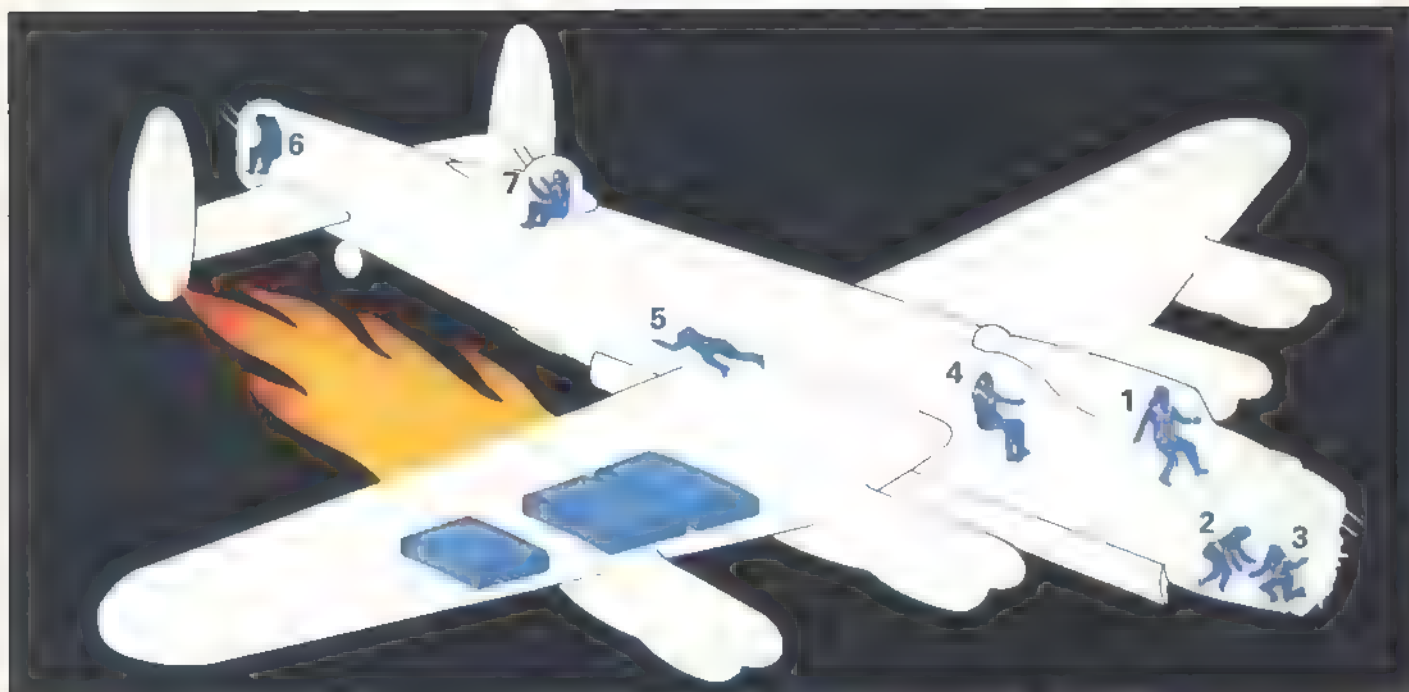
Gray managed to persuade the guard to bring them all some food, but despite this and his own battered countenance, the newcomers looked at him with undisguised suspicion and whispered among themselves. The afternoon passed in gloomy silence, broken only by the whimpering from the next cell.

A party of *Luftwaffe* personnel arrived at about 1700 and took Gray and his companions to a lorry parked outside. They were driven to the town's railway station. Fortunately, the officer in charge knew a little English and Gray pointed out Hall's condition to him. He was not unsympathetic and helped Hall up beside the driver—borrowing Gray's Irvine jacket to keep the patient warm.

As the prisoners climbed down at the railway station, the officer in charge signalled to Hall to stay where he was. That was the last Gray ever saw of his Irvine jacket or of Hall.

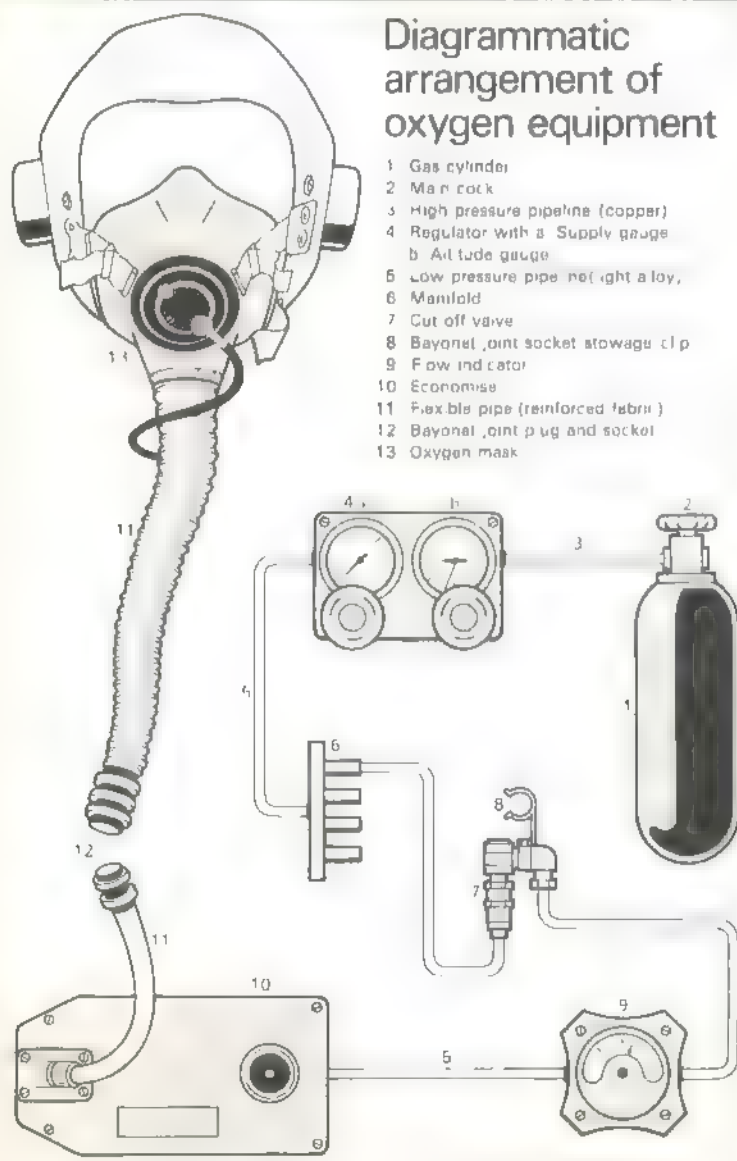
The prisoners—minus Hall—were escorted to one of the station platforms. As they stood there an air-raid siren wailed its warning. Soon, a flight of Me 109s took off from a nearby airfield and passed over the station. Gray had been flying for three years, yet these were the first enemy planes he had ever seen.

A train drew in and the prisoners were hustled aboard. There followed a slow but fairly comfortable journey to Frankfurt-on-Main. His guards were entertained with



Peter Sarson/Tony Bry

Diagrammatic arrangement of oxygen equipment



The Last Moments of T-Tare

With her starboard wing blazing, the Lancaster was out of control and in a near-vertical dive. After giving the 'Bale out' order, and receiving acknowledgements, the pilot (1), W.O. Donald Gray, left his seat to open the bomb-doors. Searing heat and light met him. How he left the stricken bomber remains a mystery. But he reached the ground by the hazardous method of hanging by his ankles from his parachute harness. Only two other crew members survived, the navigator (2), Flt. Sgt. Alan Campbell, and the bomb-aimer (3), Flt. Sgt. George Wallis.

The positions of the rest of the crew, as they were last known, were the radio-op (4), Sgt. Bert Wright, at his set; the flight engineer (5), Sgt. Joseph Grant, in the fuselage unconscious; the rear-gunner (6), Sgt. Douglas Maughan, unconscious, and the mid-upper gunner (7), Sgt. Frank Patey, in his turret. None of them survived.

◀ The life support, necessary at altitude. The rear-gunner and flight engineer both had problems with oxygen. Fixtures under pressure can be subject to failure.
 ▷ The standard air-crew parachute harness



Davis & Harrison VPLtd



GORLICE-TARNOW 1915

In achieving his objective of crippling Russia's offensive strength, Falkenhayn made the Russian Revolution possible

'My victorious sword had crushed the Russians . . . woe to them that yet draw the sword against me!' This was the Kaiser's exultant comment on the Eastern Front fighting in 1915, the odd year out of World War I which saw its largest single campaign begin with an unprecedented breakthrough at the two small towns of Gorlice and Tarnow in southern Poland then Austrian Galicia. During the campaign Russia lost two million men, 3,000 guns and her province of Poland. The Eastern Front was pushed back 300 miles to well within the borders of Russia proper. Russia's offensive in 1916, though primarily directed against Germany's ally Austria-Hungary, was to belie the Kaiser's boast in material terms but morally the military calamities of 1915 were decisive for the coming revolution.

The Russian Army had already suffered the gravest defeat of any of the Allied powers, losing almost two armies at Tannenberg in August 1914 (see 'War Monthly' issue 17), but it alone had achieved a string of important victories. As a result Austria-Hungary had lost her Polish provinces and was on the defensive in the Carpathian Mountain Passes—last natural barrier before the twin capitals of Vienna and Budapest.

Russia's achievement was truly astonishing. Her enormous army—about seven million men with the call-up of all reserves—might seem invincible. But there were few railways to carry men to the front or from point to point along it. Forced to march great distances, many units had gone barefoot through the autumn and winter of 1914-15. A third of the men lacked rifles. Those who had them seldom carried more than 20 bullets apiece. These deficiencies were matched in every sphere—aircraft, motor-transport, medical services, even in officers and NCOs. Troops, often illiterate, were under-trained. The consequent 'human wave' method of attack resulted in hosts of casualties to enemy MGs.

Russia was much worse off for artillery than any other belligerent. The ratio of two guns per thousand infantry was half the figure Napoleon had felt sufficient a century before. Such guns as Russia possessed did not have enough shells. At the height of the struggles to gain possession of the heavily-defended Carpathian Passes, the Eighth Army,

under General Alexei A. Brusilov, had been rationed to three shells a day per gun with a court martial for any officer who exceeded this limit.

Besides this, the Russians were fighting not one enemy, as were the Allies on the Western Front, but three: Germany, along their north and west frontiers, Austria in the SW and Turkey, far south, in the Caucasus.

However, for General Erich von Falkenhayn, Chief of the German General Staff, Russia's achievements were cause for alarm. Wherever he looked in the spring of 1915, all prewar calculations, all plans designed to meet the contingency of war on two fronts had gone astray. Along the Western Front stalemate had ensued with little sign of a verdict in Germany's favor. The original bone of contention, Serbia, expected to be subjugated by Austria in days, was fighting doggedly on. Turkey was threatened by the new Anglo-French naval initiative in the Dardanelles. On top of this, no one seriously believed that if Russia's Eighth Army succeeded in penetrating the Carpathians, Austria would hold out. Her collapse would place enemy forces along a third front, Germany's southern one. At any moment, Rumania and Italy were likely to declare war on the Central Powers to seize what they could from the disintegration of Ottoman and Hapsburg empires.

The only way to deter these adventures would be by a victory which changed the balance of the war. But where and how was it to be won? Germany has been propping up Austria since September 1914 and the stalemate in the west could not last forever. Men of the British Empire were taking their place in the line, side by side with the great volunteer armies being raised at home. They could be expected to pose a threat towards the end of the year. Falkenhayn, therefore, only had the late spring and the summer in which to solve his eastern problems so as to have maximum strength in France not later than September. What was needed, then, was a blow at the Russian armies of such suddenness and ferocity as would not only remove the present threat to Austria, but would achieve 'the indefinite crippling of Russia's offensive strength'. Falkenhayn had just taken 14 divisions into reserve, he decided that they must be used first in the east.

The four-month struggle which formed the realization of his plans could be said to have succeeded in its ultimate results beyond all expectations. One participating German general, Hermann von François, the hero of Tannenberg, called it the greatest advance in the history of warfare. It so extended itself in time and space from the opening battle that only an arbitrary line can be drawn between the ending of one phase and the beginning of the next. It led to what the Russians called 'The Great Retreat', a period remembered with horror by all those civilians and soldiers who were in it. Yet, paradoxically, the combination of its

◀ *World War I's Eastern Front saw vast movements and huge captures, in stark contrast to the Western Front. Here German uhlans escort Russian prisoners from Galicia; almost a million were taken during 1915. The inset German cartoon from Simplicissimus emphasizes Russia's dreadful losses by depicting the Army C-in-C, Grand Duke Nicholas, as a Macbeth impelled to go on to yet more carnage.*

◀ *Austrian infantry in shallow scooped trenches; they are armed with an 11in shorter and ½lb lighter version of the standard 50in M1891 Mannlicher service rifle (see p41).*

very success with the incredible, suicidal obstinacy of the defenders hazarded Falkenhayn's original intention of a short, sharp, but crippling blow.

The Russian front, over 1,500 miles in length, was defended by three army groups, which the Russians called (and still call) 'Front'. North Front faced the German forces in East Prussia and the Baltic States; to its right West Front defended the geographical salient formed by Russian Poland with enemy territory, held jointly by Germany and Austria, on three sides of it, to their right was South West Front, facing the Austrians and stretching down to the Rumanian frontier.

Where along this attenuated front was an Austro-German victory to be achieved? As soon as Falkenhayn announced his intention of a launching a large-scale offensive for which he had ordered some 1,000 heavy guns to be moved to the Western Front, the Russians were alarmed. They knew that the Germans were now concentrating their forces on the Western Front, and that the Russians would be left with a very weak front. Usually a strategic visionary, the Austrian Chief of General Staff, Field Marshal Count Franz Conrad von Hotzendorf, on the other hand, was concerned only with his immediate problem and needed urgent help. On this basis, he laid claim to Falkenhayn's reinforcements.

The Kaiser arbitrates

There then followed one of those bitter disagreements between Falkenhayn and the *Oberost* commanders, who had ambitions of supplanting him, and in the end the Kaiser arbitrated. To the chagrin of Hindenburg and Ludendorff he found for Falkenhayn. Brightly as Petrograd might glitter it was 400 miles from the front.

There remained the question of where success was likeliest along the Austrian front, itself about 800 miles long. Aware how Falkenhayn's mind was working it was Conrad who proposed the answer. The Russians, after their maulings in Poland would scarcely risk any weakening there, while in the south they were fully occupied. If they had a weak spot, it must be in the center. Austro-German forces attacking in sufficient strength at the right point along the southern side of the Polish salient should be able to break through, threatening his flank and the whole Polish salient. Falkenhayn agreed—again to the fury of *Oberost*, who were, however, offered some slight compensation. Their command was extended southwards as the *Oberost* were given three extra cavalry divisions. They were to launch diversionary attacks along their front in early April before the main thrust. That was to be followed by two little ex-Austro-Galician (now Polish) divisions, sent to the front to be used as a flank guard.

Planning and active preparations in the early days of April. German forces in the region were reorganized into the new Eleventh Army, under General August von Mackensen, a Tannenberg veteran. In mid-April, Conrad von Hotzendorf was at last taken into Falkenhayn's confidence. He gave his enthusiastic support, going as far as agreeing to place his Third and Fourth Armies, whose line was contiguous, under Mackensen.

By this time planning was well advanced and troop movements began. Besides reserve divisions taken from Germany, the Western Front was milked to such a degree that the balance of strength on the two fronts had shifted heavily to the east.

Approximately 22 Austro-German divisions were assigned to the Gorlice-Tarnow sector, opposed by an estimated 14 Russian. This did not give the overwhelming superiority Falkenhayn wanted and the Russians were better off in cavalry—five divisions to one. Technically, however, the Germans more than made up for this. There were in all nearly 1,500 guns assembled along a 28-mile stretch of line, including 250 heavy guns, among them several of the 420mm (17in) 'Big Bertha' siege howitzers used so devastatingly on Belgian and French fortresses. Three million rounds of ammunition were distributed in dumps placed within easy reach. To make sure that the guns could be kept close behind the advancing infantry, teams of engineers were sent to build bridges in the wake of the enemy. Secrecy and surprise were the rule, at least initially. So little was a breach feared that in late April the Tsar himself made a tour of the newly conquered areas of Galicia. He was met by General Nikolai Y. Ivanov.

Conviction of looming victory

Because of this conviction of looming victory the 145-mile stretch of front on the right of Brusilov's Eighth Army, facing the Austrian Fourth, was held by the Russian Third Army with only 300,000 men. Its sector consisted of little more than two and in a few places three lines of trench. The army was commanded by General Radko-Dmitriev, a Bulgarian by birth, known as a vigorous officer, who had himself urged that he be allowed to attack as additional pressure would at the least help Brusilov's endeavors and at best might result in a breakthrough. He had been prevented from doing so by the SW Front commander, General Nikolai Y. Ivanov.

Left inactive, a kind of lethargy had settled along the line after the winter. Troops in the opposing trenches fraternized freely. The local peasantry had even taken to grazing their sheep in No Man's Land, in places as much as 2,000 yards wide.

Yet, despite appearances, there had been a number of breaches of security, which had he known, would have caused Falkenhayn grave alarm. From about 21 April, the British and French sent word that a number of German divisions were missing from the Western Front and had probably travelled east. As far away as Petrograd there were rumors, heard by Maurice Paléologue, the French ambassador, of a 'sledge-hammer blow' about to fall in Galicia.

At the end of April, the Tsar ended his tour and almost coincidentally with his departure, Russian Intelligence produced its first direct warning: German troops had been spotted in the line opposite Third Army, squeezed between the Austrian Third and Fourth. This was Mackensen's Eleventh Army in its battle-positions. Dmitriev was sufficiently alarmed to ask Ivanov for immediate reinforcement. His commander's only reaction was to order the 3rd Caucasian Corps to move nearer Third Army's front. A further request for artillery was turned down out of hand. Dmitriev, having sent much of his to Eighth Army, had only three medium batteries along his entire line.

These refusals did not stem wholly from a culpable



David M. Phillips/Book of the Week

△ Field Marshal Conrad (1852-1925) was an inspired planner as Austria's Chief of Staff but all too often taxed his polyglot army beyond its capacity. He chose Gorlice-Tarnow as the point of attack for eight German divisions and their extra heavy guns.

▷ German machine-gunners on the Eastern Front. By April 1915 639,000 German and 664,000 Austrian fighting troops faced 1,767,000 Russians. Germany was deploying 50 divisions to Austria's 40 by December.

▽ Russia's one resource, her soldiery.



short-sightedness. In May, Brusilov was to launch the offensive which would finally carry him through and beyond the Carpathian Passes and it was felt that everything should be husbanded for this. But what was more the German diversionary attacks began in the north around Warsaw on 27 April. This led the Russians to suppose that the main blow would fall here, and made it impossible for them to shift troops to reinforce the Polish salient's southern flank.

During the last days of April, Falkenhayn moved his HQ from Mazières in the Ardennes to Pless, 15 miles west of Cracow to be in close touch with the battlefield. And on 1 May any doubts and irresolutions at STAVKA (Russian Supreme HQ), or SW Front command were settled. From the early hours a hurricane bombardment fell on the center of Third Army's line, with the enemy guns first ranging on the rear, according to German practice, to destroy communications. Dmitriev's artillery had been left unmoved so long that the Austro-German gunners knew its positions without registration and every shot inflicted damage. Except for breaks, to give air observers a chance to assess damage, it persisted all day. At its end almost all the Russian artillery had been disabled or destroyed.

Ten shells per man

After an interval through the night, the guns resumed for four hours early on the morning of 2 May, firing some 700,000 rounds of all calibres into the hapless men of Third Army. An eye-witness reported that 'the whole area was covered with shells till trenches and men were levelled out of existence.' The Russian soldier was a notoriously bad trench-digger; there were few dugouts and those existing so near the surface that the slaughter was immense. It was calculated that every front-line defender received the equivalent of 10 shells of 14lb weight; bombardment of a density unparalleled in the war so far.

Overnight, special shock battalions had pushed forward across No Man's Land to reduce the distance they would have to cover in the morning. At 1000, they sprang forward at the point of junction between Dmitriev's 9th and 10th Divisions. Opposition was nil. The few Russians remaining alive and unwounded from the barrage were incapable of resistance. They melted away before the attackers, running away half-crazed, great-coats a-flutter. In hours, hardly firing a shot, the assault groups were beyond Third Army's trench lines and into open country.

As news of the enemy attack and its disastrous results trickled back to STAVKA and SW Front it was received with sheer incredulity. The sole counter-measure taken by Ivanov was to put 3rd Caucasian Corps at Dmitriev's disposal. Force-marched into the battle zone it arrived piecemeal and could do little to impede the Austro-German breakthrough. Overnight, scattered units were drawn together and some sort of line reformed. It could do little to stay the advance and by 5 May a gap 10 miles wide and deep had been torn open. Nonetheless, the defenders persisted, fighting delaying, though sacrificial rear-guard actions and thereby giving Dmitriev time to regroup 20 miles farther east along the banks of the River Wisloka.

Ivanov, clinging to his belief that if only Brusilov could get through the Carpathians the whole course of the war would be changed, ordered Third Army to hold at all costs. But by 7 May the great German battering ram of artillery had moved up to new positions along roads and railways made or repaired by engineer teams. Though the Russians fought with the usual dogged valour, the 20 divisions

under Dmitriev's command on 1 May were now reduced to the equivalent of five. Both Gorlice and Tarnow were in enemy hands and Third Army was unable to prevent a crossing of the Wisloka at three points.

And now not only Dmitriev's center was threatened as the Austrian Third and Fourth Armies were thrown in on either side of the original thrust. Another river line was formed at the point at which the Wisloka swung eastward. Under constant pressure, this, too, had to be abandoned and a third formed farther back still, along the River San. The Russians threw themselves to destruction in counter-attack after counter-attack. They held for three days by which time Dmitriev, as he put it, 'shed all his blood'. When Jaroslav (93 miles from Gorlice) fell on 15 May he was forced to pull back still farther. The German advance had averaged $6\frac{1}{2}$ miles per day. A Vienna communique of 18 May announced the month's captures as 170,000 men, 128 guns and 268 MGs.

It was now that the magnitude of the disaster came home to SW Front: there would be no victory for Brusilov. If, indeed, he penetrated the passes he would be cut off. Ordered to retreat, the Eighth Army commander did so with his customary coolness and discipline, saving his entire army. A 300-mile stretch of the Russian front was in full retreat as the armies on both Dmitriev's wings sought to keep contact with him. Two more Austrian armies were thrown in, one at each extremity of the fluid line.

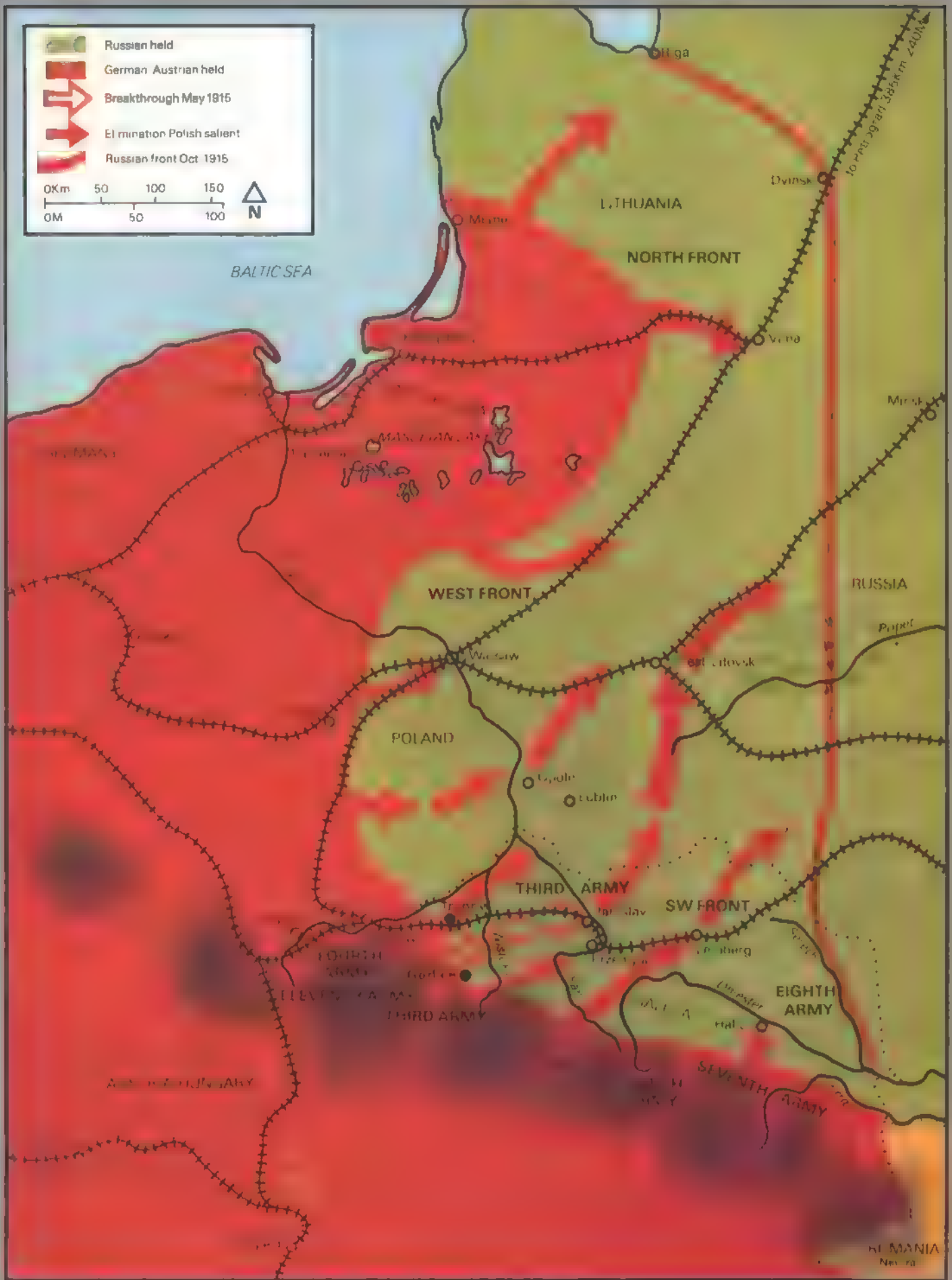
Formations being annihilated

Third Army's losses were in excess of 100,000, but this figure told only half the story for some formations which had borne the brunt of the fighting suffered even more appallingly. The 3rd Caucasian Corps, for example, brought up to establishment of 40,000 men in April, was down to 8,000. It was thrown into the battle on the San against the Austrian First Army, succeeded in taking some 8,000 prisoners and nine guns, but halved its own diminished numbers in the process. One division was down to 900 men on 19 May.

At STAVKA, the fact of retreat having been absorbed, the only concerns were to maintain the line intact and save equipment. And in this it somehow succeeded, though at gargantuan cost. Losses were such that, in the words of a British liaison officer, Third Army was reduced to 'a harmless mob'. It was losing men at such a rate that even with replacements at the rate of 2,000 to 4,000 a day it could not make them up. When, in June, the casualty figures were issued they showed that 412,000 men had fallen in the May battles and that 15 divisions of reinforcements sent to SW Front had been exhausted. Mackensen's Eleventh Army alone took 153,000 prisoners and 300 guns by the end of May.

As stories of military disasters, casualties and the conditions under which the men were fighting spread inside Russia, rioting broke out, particularly among a group of the oldest reservists, called up for the first time since the Crimean War. In one case disturbances lasted three days and shots had to be fired before the rioters dispersed. They did so shouting, 'Beasts! You have no ammunition to fight Germans, but plenty to shoot down Russians!'

In the trenches, voluntary surrender and reporting sick became common subterfuges to evade the struggle, but nothing could mitigate the cruel realities of the mortal combat now being fought out. Having crossed the San by 15 bridges, Mackensen's reinforced Eleventh Army



A full-length photograph of a man in a military uniform, standing and holding a rifle. He is wearing a beret, a high-collared jacket, and breeches. The image is framed by a thick black border.

*Army in old Army's right
around Lublin in July
1915. The man wears his
rgt cypher on shoulder
strap and the national
cockade on his flat
cloth cap. He only has
one ammo pouch
(30 rnds) instead of
three for his .30in
M1891 Mosin- Nagant
rifle. Note the
rare spade.*

sailed toward the fort. It was the father of Prayers, who fell in March 1906. Then by February 1907, a group of the great Augustan resistance Indians at the homes gathered for a religious retreat. The British had done Prayers' house in the Tule Valley, to which he went, and the action of the United States Army on the late 1906, on the day of the Revolution. By 17 June the defense had been broken on several new lines, and all the land on the 22 August. Huang's soldiers were by 1908, and the 1909, thousands of soldiers could take by the fort. The first night of winter the Americans were in a situation to move away. A large American force of 100 soldiers and 1000 men of the Chinese, and a 1000 soldiers of the British, and the 1000 the 1000 Army and 1000 soldiers of the Chinese, and the 1000

For TADs, we also observed that the A-to-G conversion frequency was higher for TADs highly enriched for proteins involved in transcription, compared to the other KEGG categories. In particular, within the transcription category, the frequency of A-to-G conversion was higher for two sub-categories: Adenovirus, Herpesviridae and other related viruses, and other related viruses, compared to other categories. This suggests that the frequency of A-to-G conversion is higher for TADs highly enriched for proteins involved in transcription, compared to other KEGG categories.

I am a very poor person, and I am not a very good one. I do not know what I am doing, and I do not know what I am saying. I am a very poor person, and I am not a very good one. I do not know what I am doing, and I do not know what I am saying. I am a very poor person, and I am not a very good one. I do not know what I am doing, and I do not know what I am saying.



had declared war on 25 May and Austrian forces might have to be sent to the Isonzo. It could be said that only Allied mid-summer inactivity on the Western Front (though some small relief attacks were launched) saved him from his dilemma and made the Russian disaster more complete.

For Russia nothing could palliate the tragedy, obscure the failures of command, or rectify the scandal of equipment shortages. Least of all could it relieve the grief now spreading into the very smallest and most remote villages. All this left an indelible hatred of the Tsarist regime.

It was generally agreed among the more enlightened officers that the only possible response by an army, so incapable of parrying the blows that befell it, was a swift retreat, even at the cost of the Polish salient.

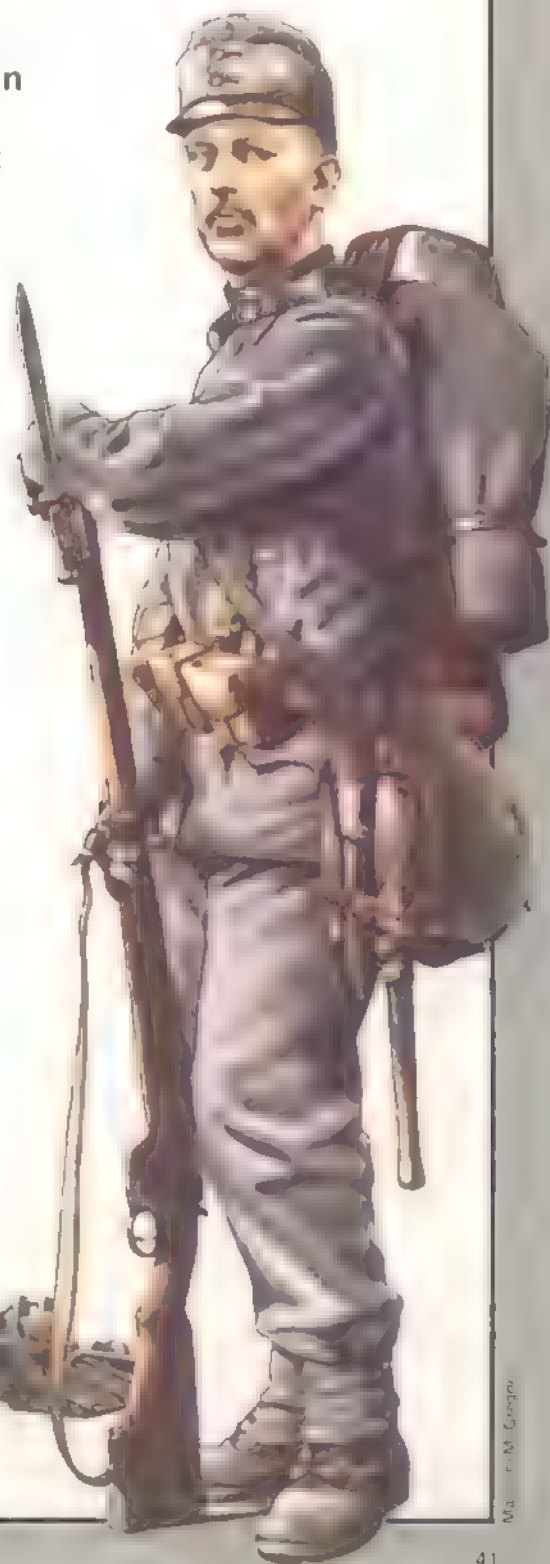
Warsaw was evacuated and fell on 4 August to the new German Twelfth Army, by which time 750,000 Russian prisoners had been taken. At the end of the month Poland was entirely in Austro-German hands and Falkenhayn began switching divisions back to the Western Front. The Gorlice-Tarnow campaign proper was over though there were to be separate Austrian (in Galicia) and German (in Lithuania) offensives lasting until October before autumn rains and solidifying Russian resistance on a shortened front enforced a halt for the winter.

On 5 September the highly respected and soldierly Grand Duke Nicholas Nicholasovich who belatedly but skilfully had withdrawn his armies, was replaced as C-in-C by the Tsar himself, a man totally without command experience. Hearing this news, his uncle, Prince Yussopov, threw up his hands in horror: 'This is dreadful. I feel it is the beginning of the end. It will bring revolution.' A similar view was expressed by the industrialist Putilov to Paléologue: 'The days of Tsarism are numbered . . . 'Revolution is inevitable . . . ' There will be 10 years of anarchy.'

Ward Rutherford

▽ A zugsführer (platoon sergeant) in the Imperial and Royal Infantry Regiment Count Daun, nr. 56, part of 12th (Galician) Infantry Division, 6 Army Corps in the Austro-Hungarian 4th Army that broke the Russian line NW of Gorlice on 2/5/15. The sergeant (three stars on the green regimental facing of his collar) holds a standard M1895 Mannlicher 8mm (.315in) rifle, 1½lb lighter than the Russian's, with four 30-rnd ammo pouches and 9½in bayonet (Russian 16½in). His 2lb Linnemann entrenching tool is 20in long.

Austro-Hungarian Infantry Sergeant



German 210mm Heavy Howitzer

Two heavy artillery pieces that obliterated weak Russian defenses in Galicia during 1915. Left an Austrian 305mm (12in) Skoda siege mortar, this 20-ton equipment flung 838lb shells to 7½ miles every six minutes at 1,120fps. Right an Army-level weapon of 8.3in calibre that fired 250lb rounds to four miles.





CASTRO TAKES CUBA

Revolutionary leader Fidel Castro (center) is joined by his brother Raul (left) and Che Guevara (right) in 1956 and (above) Batista fled Cuba. Ten years later, Batista died

The active phase of the Cuban revolution led by Fidel Castro can be said to have started when 82 revolutionaries sailed from Mexico on 25 November 1956 and landed in Cuba eight days later. It ended on New Year's Eve 1958. President Batista fled the country. Fidel Castro entered Havana and assumed power.

In those two years there were innumerable skirmishes, ambushes, attacks on Government posts and army patrols, and defensive actions against Batista troops sent out to destroy the rebels, but only two set-piece battles were fought. The first was a numerically slender affair at El Uvero in November, 1957; and the second the major battle of Santa Clara in December, 1958. It ended all Government opposition and Batista fled.

At the Montevideo Conference in 1933 the United States agreed to the principle of non-intervention in the political affairs of Latin America. Cuba was included. With freedom from outside interference Fulgencia Batista became the leading figure in Cuban politics. At first he was content to wield power through a series of pet presidents, but in 1940 he maneuvered himself into the presidency. Under

his control the island's economy improved and certain useful public works—especially roads—were completed. In 1944, Batista retired to Florida. Three presidents followed, the last being Carlos Prío Sacarras. Under them the economy went to pieces, thuggery and gangsterism thrived, and bribery and corruption flourished. In March 1952, Batista returned, ostensibly as a candidate for presidency but in a two-hour *coup-d'état* he seized power, suspended the Constitution and became a dictatorial president.

This action wrecked the plans of a 27-year-old-lawyer Fidel Castro, to be elected to Congress. He attempted to get Batista's seizure of power declared illegal. When this failed he led a party of 165 followers in an attack on the Moncada Barracks, in Santiago de Cuba, Oriente Province. The barracks were garrisoned with about 1,000 troops and Castro's intended surprise night attack was frustrated by alarm bells that roused the garrison. Many of the attackers were killed, and 27 were captured, tried and sentenced to 15 years imprisonment at the penal station on the Isle of Pines. Among these were Fidel Castro and his younger brother Raul.



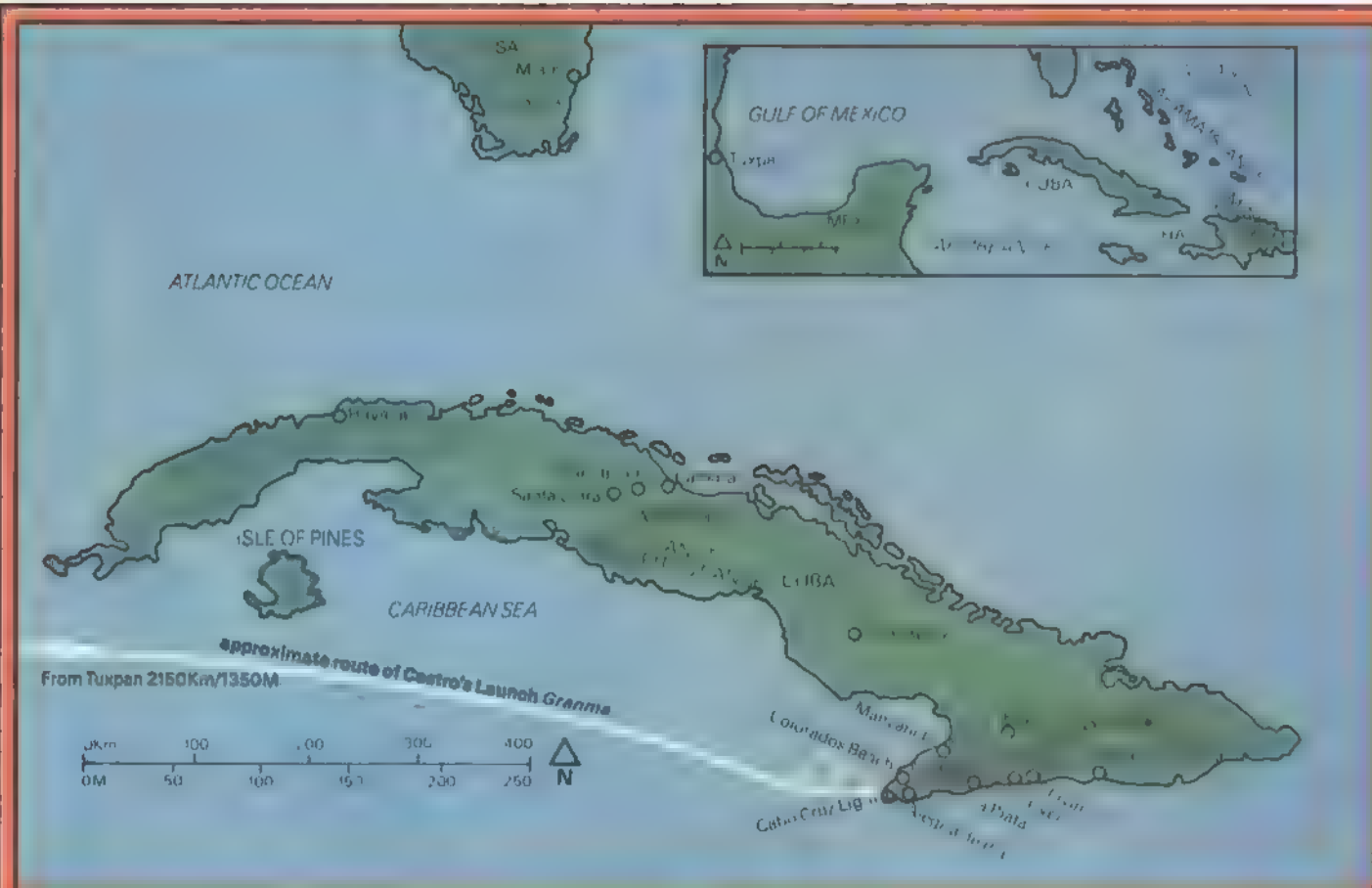
11* Fidel Castro (center) with his brother Raul (left) Cuban dictator Batista (right) guarded by gangsters
Panic in Havana as French cargo ship La Coubre is blown up by anti-Castro group. The blast killed 100 people

In May 1955 Batista faced a hostile public because of his refusal to allow free elections. As a sop to the people an amnesty for political prisoners was declared and among hundreds of others, Castro and his companions were released.

They went to Mexico and on a 60 acre ranch began regular training in guerrilla tactics under the tuition of the veteran Spanish Civil War fighter General Alberto Bayo. They enlisted recruits, set up agents in the US and elsewhere and issued anti-Batista propaganda in Cuba and throughout the world. Their eventual aim was to invade Cuba and overthrow the Batista regime. In memory of the Montecada attack the whole scheme was called the '26th of July Movement', a name that was retained during and after its two year life and one which distinguished it from a dozen other revolutionary movements.

The revolutionaries had a hard time in Mexico. They were harried by the Mexican police and spied upon and reported by FBI agents and by informers employed by Batista's government. They had to leave their ranch and move several more times until at last the actions of a traitor forced them into hurried departure before they were ready.

An ocean going launch, the *Granma* designed to carry eight passengers and six crew had been acquired. On 5 November 1956 they quickly loaded into this craft all the rifles, uniforms, equipment and ammunition they could muster, with a minimum of food on the principle that food could be far more easily obtained in Cuba than



munitions of war. Eighty-two men packed themselves into *Granma* and she sailed without lights down the Tuxpan River.

It had been arranged that the invaders be met at Niquero, west of Santiago, by a supporter with trucks, food, munitions and about 100 armed men. The intention was then to move on to Manzanillo, join up with other rebel groups and attack the government troops in that city. Hundreds were expected to join the movement, armed with the weapons seized in Manzanillo. Like so many Cuban revolutionary plans in these early days this one went completely awry.

When the crammed *Granma* met the gale tossed open sea 90 per cent of her complement became seasick. Conditions were chaotic. On 1 December, two days overdue, the ship approached the coast but the crew was unable to find its navigational objective, the Cape Cruz Light. The navigator was washed overboard and for more than an hour the vessel circled in the darkness until, almost miraculously, he was found and picked up.

A sense of direction had been lost and just after dawn the launch ran aground on Las Coloradas beach. The invaders found themselves in a large mangrove swamp and unloading was difficult. Day was breaking and they were soon spotted by a coastguard patrol boat which radioed their presence to Havana. They were shortly strafed again and again by Batista's aircraft. They waded through the swamp for three days, eventually reaching dry land at a sugar plantation at Alegria de Pio. Here they were attacked and scattered by Government land forces.

The few survivors, moving only by night, struggled back into the dense cover of the forests of the Sierra Maestra.



The largest party, consisting of 82 men, was led by the Argentine doctor Ernesto 'Che' Guevara, who had named Fidel Castro in Mexico and was to become second in command and the main adviser of the 26th July Movement. He realised that his party had no money, but a few rifles and cartridges he had collected from a munition. Their new clothing, packs and other equipment had been left in the swamp. For two days, the Alegria de Pio he was ordered to follow Castro by local peasants. The trouble it was now left to be known to Cuban history as 'the escape'.

This small band, poorly armed and short of most of the necessities of life, was the embryo of the revolution, which was to bring Batista down in two years. When Castro entered Havana as the conqueror in 1959, it was slowly for soldiers recruits and the revolution in effect. The numbers of the army and the dependence for food and intelligence on the peasantry. Arms were a major problem and most of the groups



▲ Raul and Fidel Castro with Juan Almeida at their Sierra Maestra hide-out in Oriente Province, Eastern Cuba

▲ The route taken by Granma and her landing point in Cuba in December 1956

Granma—built to carry 14 men, she bore 82 to Cuba

early offensive actions in attacking or ambushing small parties of Government troops were carried out solely for the sake of the weapons they could capture. Che Guevara records as a really notable achievement a successful action at La Plata on 17 January when they captured eight Springfield rifles, one Thompson submachine-gun and 1 000 rounds of ammunition.

On 16 March, 50 reinforcements came in—20 of them armed—and on 19 May what to them was a major supply of arms was smuggled in through Santiago. This consisted of three tripod MGs, 13 automatic rifles, nine carbines and 6 000 rounds of ammunition.

As far as arms were concerned Batista could get all he needed from the United States until March 1958 when an embargo was placed on further exports. From then on he had to rely on a small supply of very inferior weapons from Dominica. The arms supplies of the revolutionaries, a week after their landing, were tiny. They failed to gather more immediately, but once they were established a trickle of arms reached them. In addition to weapons seized in action many were available in Santiago (illegal and hidden, of course). Havana was bursting with them. The Santiago arms were specially intended for Fidel Castro, but those in Havana and other ports had been smuggled in for the benefit of several anti-Batista movements. In 1957 and early 1958 Castro was not generally thought to be the man who would make the best use of them.

Arms were bought wherever available, mainly in the US

and shipped surreptitiously to Cuba. US police and customs officials did their best to stop these shipments from Florida and elsewhere, but it is now thought that only about one-tenth of the total was intercepted.

The arms were bought with money raised throughout the world by anti-Batista sympathizers—many but not all of them pro-Castro. One of the main suppliers in Castro's interest was Carlos Prío Sacarras, the ex-President who fled when Batista returned to power, and who had control of an immense private fortune.

When Castro received the reinforcements and arms he decided to mount a more ambitious raid. On 23 May he sorted out his force, discharging many doubtful characters including one whole platoon. He was left with 127 men, nearly all armed and 80 well armed. The latter were to attack El Uvero.

This settlement consisted of no more than a barracks, a sugar factory, and the sheds of a timber company, with a few buildings housing the employees of the civilian concerns and their families. This tiny community west of Santiago is separated from the sea only by an east-west road linking the hamlets of Paladero and Chivimico. The barracks was not fortified and the main defense lay in four armed posts manned by about six men each.

Plan of attack

The attack—executed in daylight—was planned to eliminate these posts and then to assault the barracks on both flanks while a third party maintained fire on the building from a position directly in front of it. A fourth party set up an ambush on the road to the west. Any Government reinforcements must come this way. The guerillas' GHQ consisted of Fidel Castro and a couple of aides. It was sited on a hillock a few hundred yards to the north.

The attack went in. Direction was soon lost in the scrubby country and heavy casualties were suffered. The attackers were hampered by their determination not to kill or injure any civilians. A series of fire-and-movement actions overcame the posts. When the defending army lieutenant was wounded the barracks surrendered after about two hours' interchange of small-arms fire.

The effect of this skirmish on the general situation in Cuba was out of all proportion to its limited scope. Up to this point the '26th of July Movement', with its scanty forces tucked away in the remote recesses of the Sierra Maestra, was not seriously considered by the mass of the Cuban people and its actions were assiduously played down by Batista's propaganda. The battle raised the morale and the prestige of the guerillas to a remarkable degree. Recruits volunteered in greater numbers and greater efforts were made in Florida and elsewhere to provide arms and money for the rebels. Other active anti-Batista groups began to regard Fidel Castro as an acceptable leader.

The numbers involved at El Uvero were small—53 on the Government side and about 80 on the rebel side. But the casualties were proportionately so heavy that Che Guevara, who led a platoon, gave exact details. On the rebel side there were six killed and seven wounded, 14 taken prisoner and six escapes, making a total of 38 rendered *hors de combat* out of 133.

Castro returned to his mountain hideout with the fit men and the welcome supply of arms and ammunition they had seized. Che Guevara escorted the wounded and made a slow withdrawal, with many narrow escapes from the Government forces that immediately swarmed into the area.

The guerrillas regrouped in the mountains and for several months did little but harass the Government in every possible way, disrupting communications and attacking small posts and villages to seize arms and supplies. All civilian supplies were paid for. Prisoners of war were simply disarmed and set free.

In Havana and most of western Cuba the opinion among the middle and upper classes was that hundreds of miles away to the east a small party of rebels was causing trouble for some vague concept called 'freedom'. But thousands of workers and students detested Batista's autocratic regime and supported one or other of the many revolutionary bodies.

The upper and middle classes were well satisfied with the regime as it stood. A few important figures viewed Batista's activities with distrust and some moved actively against him behind the scenes. Among those especially happy with the situation were the merchant and financier classes, which included importers, hoteliers, shop owners, transport organizations, licensed gaming establishments (of which there were many) and brothels of every description from the ultra-exclusive to the lowest dockside bawdy houses—all paying their dues to the State. Money was pouring into the country, internally from excellent sugar harvests and externally from the vast numbers of money-squandering tourists from the United States, Southern America and Europe. Cuba at that time provided all that the rich man's 'easy life' demanded—unlimited pleasure and vice of every sort with no irritating restrictions.

Life was less blissful for the working classes and students. Throughout the two years under review there were constant uprisings in Havana and other towns—badly organized by many bodies and particularly by the Revolutionary Directorate, which had no connection with Castro until late 1958. These were ruthlessly suppressed. Hundreds of dissidents were executed.

Privileges of power

Batista's regular army, with a strength of about 20,000, was very well paid by local standards and the troops were granted many privileges which made their lot a contented one. At the time of Castro's landing they were solidly behind their Dictator, as were the secret police, the dreaded SIM. This remained true throughout 1957, but morale deteriorated as 1958 progressed.

By early 1958 Castro had made contact with many revolutionary organizations in western Cuba, and with the Trade Unions. He was mainly responsible for arranging a general strike that was to take place on 9 April. It was to be supported by all the armed revolutionary bodies in the urban areas. This was a complete fiasco, but in the long run had more influence on Batista's downfall than did any other single incident. The trade unions did not strike, but scores of small unco-ordinated parties of armed dissidents attacked Government offices and posts. Batista's forces dealt with them separately and easily. Not only were armed rebels killed in action, but hundreds of youths were murdered whether or not they had any part in the uprising, their bodies left lying in the streets.

The failure of the strike undermined Batista's position in three ways. First, many hitherto contented citizens—some of whose sons were among the victims—realized that they were living under an illegal regime. Secondly, hundreds of youths, especially students, realized that they were in extreme danger whether or not they supported

Fidel Castro





▲ *Castro's finest tactician, the legendary Argentinian doctor Ernesto Che Guevara.*

◀ *Fidel Castro in familiar garb and armed with a Springfield sporting rifle.*

▶ *Stamp commemorating the Battle of Santa Clara.*



any revolutionary party, and as a consequence flocked to Castro's standard as being a safer place than their own houses or universities. Thirdly, many of the Government troops themselves became sickened with the murderous work they were ordered to carry out. This fact, and the constant propaganda to which they were subjected by Castro's 20 or so radio stations situated in the hills, began to undermine their morale. By the autumn of 1958 large sections of the army could no longer be regarded as a reliable fighting force. All these months, too, prisoners taken by the rebels were returning to their units with tales of good treatment.

Following the strike, Batista found himself in a strong position. All revolutionary activity in the towns, including Havana, had been completely suppressed, and he no longer had to tie up more than half of his army in internal security.

He determined to invest the Sierra Maestra and kill or capture Castro's entire force. He sent an expedition of 10,000 troops, supported by considerable numbers of tanks and guns, and with aircraft available on call at any time, to bring this about. The whole scheme was a hopeless failure. Castro and his men—not more than 300 of whom were armed—retreated into the forest, emerging for hit-and-run actions against the regular troops. The latter fought only half-heartedly. When the abortive campaign was called off 2½ months later, the Government forces had suffered 1,000 casualties and had abandoned 600 weapons, including one tank, 12 mortars, 12 heavy MGs,

'an impressive quantity of automatic arms and an incredible amount of equipment and ammunition.'

The youthful volunteers flocking to Castro could now be armed and trained.

Revolutionary tactics changed. It was no longer necessary to act purely on the defensive. An active offensive was planned. As a preliminary, it was decided to invade Las Villas province immediately to the west. In the meantime villages and towns in Oriente province were captured and held—Raul Castro carrying out a vigorous campaign in the north. Bayamo, a town of over 100,000 inhabitants, and field headquarters of Batista's eastern army, was seized and put to the flames.

Two columns set out to invade Las Villas province. The northern one, led by Major Camilo Cienfuegos, experienced some difficulties but attained their objective in good order. The southern column was led by Che Guevara, and he suffered what seems to have been his perennial bad luck. They set off in trucks. A cyclone destroyed some of these and made the road impassable by landslides. On they went, with some limited horse transport, on 1 September but they were dogged by ill fortune. It rained non-stop and they were spotted and continually strafed by aircraft. They lost most of their equipment when they had to swim the Jucaro River into Camaguey in order to avoid encirclement by Batista troops. In Guevara's own words: 'We were quite enfeebled and furthermore lacked footwear: many comrades marched barefoot through the mud of Camaguey.' They straggled into the shelter of the thickly forested Sancti Spiritus Range. Here, they re-armed and reinforced. They quickly regained their morale.

Blitz by the revolutionaries

With the general aim of disorganizing the Government and the specific one of preventing people going to the recently ordered polls, the columns of north and south started a general blitz on all towns and communications. They bulldozed parts of the Central Highway and prevented nearly all movement—official and civilian. On 6 December they blew a bridge over the River Falcon on the Central Highway. All land communications between Havana and the eastern half of Cuba ceased. Among the many actions, the important northern port of Caibarian was taken and the more southerly town of Camajuani surrendered without resistance.

About 200 miles east of Havana is the town of Santa Clara—the capital of the province. It was the hub of the central plain and a vitally important rail and road center. The second city of Cuba, it had a population of about 150,000. It had the usual government offices of a city its size, including a university, a strong police post, and a permanent garrison composed in the main of the least disaffected troops of Batista's army.

Encouraged by the successes of his columns in the eastern half of the island, Castro decided to attack Santa Clara. But before describing the final battle other events in the rest of the island are worth a mention. Once Batista had committed the bulk of his forces in the east, minor insurrections and incidents occurred in many parts of the west, especially in the coastal areas south of Havana. In Oriente Province Raul Castro had surrounded Santiago de Cuba. He had neither the strength nor the desire to attack the city, but maintained a force in the hills and along the roads—effectively sealing up 6,000 well-trained Government troops in the city itself and preventing them from taking



The aftermath of one of the many sporadic guerilla raids mounted by Castro's revolutionaries against Cuban towns in their struggle to overthrow Batista. Government troops approach the dead—possibly caught in the crossfire.

any active part in the events that were happening in the center and west of the island.

It is clear now that Batista, in his palace in Havana, was already feeling uneasy. Three of his generals had reported that his troops were not fighting well and he had firm intelligence that public opinion had turned against him. He kept up appearances. The New Year's Eve presidential ball was an annual event of importance, to which all diplomatic and many other important foreign personages were invited. The invitations went out as usual.

When making his decision to attack Santa Clara Castro had an armed strength behind him which far outnumbered anything he had commanded in the past. In addition, he was closely associated in this action with the troops of the Revolutionary Directorate, which among lesser objectives undertook to capture the strongly defended Barracks No 31 of the Guardia Rural.

The battle began on 29 December. Castro set up his HQ in the University which lay well outside the city. Resistance continued all the following day in the surrounding Capiro Hills. But in the meantime the power station and the entire north-western section of the city had been captured. The police station and its defending tanks fell next, and a (perhaps deliberately) premature radio announcement that the whole of Santa Clara was in revolutionary hands preceded the surrender of Barracks 31, the prison, the courthouse and some other government buildings.

The most spirited action was against an armored train, which, manned by reliable troops, had been sent to reinforce the Santa Clara garrison. When it became clear that the city was falling, the train drove off, but a junction about a mile outside had been blown up—halting its progress. There was very sharp action. Machine-gunners, behind the cover of their armament, shot down the attackers. The rebels crept forward and used bazookas and petrol bombs against the train. Finally, it was set on fire and the survivors surrendered.

In Santa Clara itself men on the 10th floor of the Hotel Grand held out until the final surrender. So did the defenders of the Leoncio Vidal Barracks, the largest fortress in Central Cuba. On New Year's morning two captains came out under a flag of truce to negotiate a surrender. When they learned of Batista's flight all resistance everywhere ceased.

Among those present at the New Year's Eve ball was Mrs R. Hart Phillips, Cuban correspondent of the *New York Times* for many years and author of *Island of Paradox*. The ball started with its usual display of color and uniforms as Batista received his guests. The only unusual note lay outside the Palace, when normally Havana would be *en fête*, but which on that night was almost deserted. As the evening progressed, figures disappeared. There was much noise of aircraft at the airport. A couple of hours after midnight it was realized that the President and scores of others were no longer present. He, many of his generals, and most of his governmental supporters had boarded aircraft and fled to Dominica.

New Year's Day found the people of Havana in a puzzled state. Very few people knew what had happened but there were no government troops or police in evidence. Castro youths came into the streets and controlled traffic, and Mrs Phillips said that it was rather like Boy Scouts taking over the traffic control of a big city. There was initially some looting, but as some of Castro's forces entered Havana the rule was 'get off the streets or be shot'. This effectively put an end to all looting and any attempt at rioting. Troops continued to arrive from the fighting fronts, most of them youths, and Mrs Phillips stresses that, unusual in any revolution, there was no drunkenness.

By the end of the week everything had been tidied up, and on 8 January 1959, Fidel Castro entered Havana amid scenes of intense enthusiasm both for the man and for his declared intention of forming a liberal government.

Kenneth Mansfield

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